Fact Sheet and Permit Rationale

National Pollutant Discharge Elimination System (NPDES)
General Permit (GP) for
Discharges from Application of Pesticides

NPDES Permit No. SCG160000

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TABLE OF CONTENTS

Appendices

I. Background

This permit is being issued by the South Carolina Department of Health and Environmental Control (SCDHEC, Department) to authorize point source discharges to surface waters of the State from the application of pesticides for specific pesticide use patterns as defined in Part 1.1.1 of the permit. The Department's permit and fact sheet/rationale were developed using EPA's Proposed 2010 NPDES Pesticide General Permit and Fact Sheet (June 4, 2010 Federal Register**,** Vol. 75, No. 107, p. 31775) as a basis. EPA's draft permit and fact sheet were altered as necessary to incorporate information specific to Department regulations, to more accurately reflect use patterns in South Carolina, and to ease the burden on the Department and the Permittee where the Department felt such changes were reasonable and appropriate. The Department recommends that the Permittee read EPA's 2010 NPDES Pesticide General Permit Fact Sheet for more information regarding the history of the requirement for pesticide regulation under the NPDES program and for additional information regarding the development of permit requirements. EPA's Proposed 2010 NPDES Pesticide General Permit and Fact Sheet can be found at http://cfpub.epa.gov/npdes/home.cfm?program_id=410.

II. General Information and Structure of this Permit

1. General Information

a. The effluent from this facility may be subject to the requirements of any of the following regulations: Regulations 61-9.125, 129, 133, and 403; 40 CFR Part 136; Subchapter N (40 CFR Parts 400 through 402 and 404 through 471).

b. Authority: This permit is written in accordance with applicable laws and regulations including, but not limited to, Regulation 61-9, Regulation 61-68, SC Pollution Control Act (PCA) and federal Clean Water Act (CWA).

c. Under Regulation 61-9.124.8 (Fact Sheet), a fact sheet shall be prepared for every draft permit for a major NPDES facility or activity, for every Class I sludge management facility, for every NPDES draft permit that incorporates a variance or requires an explanation under section 124.56(b), and for every draft permit which the Department finds is the subject of wide-spread public interest or raises major issues. The Rationale will be included as part of the Fact Sheet prepared under this regulation.

d. The conclusions noted in the Rationale establish proposed effluent limitations and permit requirements addressed in Regulation 61-9.122.43 (Establishing Permit Conditions), Regulation 61-9.122.44 (Establishing Limitations, Standards and other permit conditions) and other appropriate sections of Regulation 61-9.

2. Structure of this Permit

The permit is divided into eight parts: (1) coverage under this permit, (2) technology-based effluent limitations, (3) water quality-based effluent limitations, (4) monitoring, (5) pesticide discharge management plan, (6) corrective action, (7) reporting and recordkeeping, and (8) Department contact information and mailing addresses. Additionally, the permit includes four appendices with additional conditions and guidance for permittees: (A) definitions, (B) standard permit conditions, (C) notice of intent requirements, and (D) notice of termination requirements.

Operators should carefully read each part of the permit to assess whether or what portion of the requirements in each part may apply to their activities. As will be discussed in more detail in Part III of this fact sheet, the permit establishes different requirements for different types of pesticide use patterns, different types of operators, and different sizes of areas treated and managed for the control of pests. The organization of the permit is intended to clarify the applicable requirements for permittees.

Effluent Limitations in the Permit

Part 2 of the permit contains the technology-based effluent limitations. Part 3 of the permit contains the water quality-based effluent limitations. These Parts of the permit contain effluent limitations, defined in the CWA as restrictions on quantities, rates, and concentrations of constituents that are discharged. CWA section 502(11). Violation of any of these effluent limitations constitutes a violation of the permit. As is described in more detail in Part III.2 of the fact sheet, under the CWA these effluent limitations can be narrative rather than numeric.

The technology-based effluent limitations set forth in Part 2 require the operator to avoid over-application of pesticides that may result in a discharge to surface waters of the State. The technology-based effluent limitations section is divided into two parts. The first part applies to all operators and addresses the general requirement to avoid over-application of pesticides that may result in a discharge. In this part, all operators must avoid over-application of pesticides that may result in a discharge by using an effective amount of pesticide product per application consistent with label requirements and optimizing the frequency of pesticide applications necessary to control the target pest (taking into account pest resistance concerns), perform regular maintenance activities, and calibrate and clean/repair application equipment. The second part requires certain operators to implement additional Integrated Pest Management (IPM) Practices which involve the following: (1) identifying and assessing the pest problem; (2) assessing effective pest management; and (3) following specified procedures for pesticide application (see Part 2.2 of PGP).

In addition to the technology-based effluent limitations, Part 3 of the PGP contains the water-quality-based effluent limitations. The operator must control its discharge as necessary to meet applicable water quality standards. Any discharge that results in an excursion of any applicable numeric or narrative EPA-approved state water quality standard is prohibited. In general, based on the data included in the record and the additional requirements in this permit in addition to FIFRA, the Department expects that compliance with the technology-based effluent limitations and other terms and conditions in this permit will meet applicable water quality-based effluent limitations. However, if at any time the operator, or the Department, determines that the discharge causes or contributes to an excursion of applicable water quality standards, the operator must take corrective actions as required in Part 6, and document and report the excursion(s) to the Department as required in Part 7. Furthermore, consistent with Parts 3.0 and 6.3, the Department may impose additional water quality-based limitations on a site-specific basis, or require the operator to obtain coverage under an individual permit, if information in an NOI, required reports, or from other sources indicates that, after meeting the technology-based limitations in this Permit, the discharges are not controlled as necessary to meet applicable water quality standards. The Department also notes that among the eligibility requirements for coverage under this permit are that it does not cover discharges of any pesticide into a water impaired for that pesticide. And it does not cover discharges of any pesticide into a Tier 3 water without prior approval of the Department (subsequent approval if in response to a "declared pest emergency situation" as defined in Appendix A of the permit). While not specifically framed as effluent limitations, these eligibility conditions further help to protect water quality on a water-body-specific basis.

Pesticide Discharge Management Plan (PDMP)

Distinct from the technology-based or water quality-based effluent limitation provisions in the permit, Part 5.0 of the permit requires operators that exceed any annual treatment area threshold (with the exception of those solely performing "pesticide research and development" as defined in Appendix A, for-hire applicators, and on a case-by-case basis, those requesting coverage under Part 1.1.1.f (Other Similar Activities)) to prepare a PDMP to document the implementation (including inspection, maintenance, monitoring, and corrective action) of control measures being used to comply with the effluent limitations set forth in Parts 2.0 and 3.0.

In general, Part 5.0 requires that the following be documented in the PDMP: (1) Information regarding people involved with the program; (2) pest management area description; (3) control measure description; and (4) schedules and procedures pertaining to control measures used to comply with the effluent limitations in Part 2 (e.g., application rate and frequency, spill prevention, pesticide application equipment, pest surveillance, and assessing environmental conditions) and pertaining to other actions necessary to limit discharges (e.g., spill response procedures, adverse incident response procedures, and pesticide monitoring schedules and procedures). The PDMP must be kept up-to-

date and modified whenever necessary to document any corrective actions as necessary to meet the effluent limitations in this permit.

Public Availability of Documents

Part 5.3 of the permit requires that the operator retain a copy of the current PDMP (if a PDMP is required for that operator) at the address listed on the NOI and it must be immediately available, at the time of an onsite inspection or upon request to EPA and/or the Department. NOIs will be publicly available through the Department's Freedom of Information Center (803-898-3882). The NOIs generally will be available to the public for 10 days before permit coverage begins. During this time period, issues can be raised with the Department, who has the authority to deny coverage. The Department may also list operators who have submitted NOIs on the internet if resources allow. It should be noted that, initially, NOIs may not be available until sixty (60) days after the effective date of the permit as discussed in Part 1.2.3 of the permit.

3. Sharing of Responsibilities

This general permit was developed with the understanding that there may be more than one responsible entity implementing it for a given discharge. For those entities required to submit an NOI, EPA's draft permit allows either the entity paying for, or making the decision to perform pesticide application, to submit the NOI, or the contractor actually applying the pesticides to submit the NOI, or both. The Department felt that this approach could possibly lead to confusion within the permitted community as to who was ultimately responsible for compliance with the permit. Because both entities are responsible for compliance with different aspects of the permit, the Department is requiring that both the owner and any for-hire applicator that the owner may hire, must submit an NOI if above a threshold. However, the location of the application need only be specified on the NOI submitted by the owner. The owner is also responsible for development of the PDMP. If below the threshold, neither the owner nor the for-hire applicator is required to submit an NOI or develop a PDMP. An exception to this is owners requesting coverage under Part 1.1.1.f of the permit (Other Similar Activities) – these entities are required to submit an NOI regardless if they are above or below a threshold. Also, owners commencing pesticide research and development are not required to develop a PDMP. A chart summarizing an entity's responsibilities under the permit is included below:

Entity/situation	NOI[1] required?	Location info needed?[2] (NOI)	IPM required?	PDMP required?	Meet other requirements of permit?
Owners – *Below Threshold*	No	N/A	No	No	Yes
Owners – *Above Threshold*	Yes	Yes	Yes	Yes	Yes
For-Hire Applicators – *Below Threshold*	No	N/A	No	No	Yes
For Hire Applicators – *Above Threshold*	Yes	No	Yes	No	Yes
Owners commencing pesticide research and development – *Below Threshold*	No	N/A	No	No	Yes
Owners commencing pesticide research and development – *Above Threshold*	Yes	Yes	Yes, as per Part 2.2 of permit	No	Yes
Owners requesting coverage for "Other Similar Activities" -- Part 1.1.1.f	Yes	Yes	Case-by-case determination	Case-by-case determination	Yes

Notes:

1 Owner required to submit NOI if the application of pesticides at his direction is above, or is reasonably expected to be above, an annual threshold regardless of whether owner is performing his own work or work is performed by a for-hire applicator. For-hire applicator required to submit NOI solely on basis of whether he exceeds, or is reasonably expected to exceed, the annual threshold (i.e., independent of whether owner needed to submit NOI for same activity). "Other Similar Activities" requires NOI independent of threshold calculation.

2 Detailed location for NOI would be identification of surface water(s) of the State for Aquatic Weed and Algae Control and Aquatic Nuisance Animal Control and number of acres (or linear miles, as appropriate) affected. For Mosquito and Other Flying Insect Pests, Forest Pest Control, and Intrusive Vegetation Control, detailed location for NOI would be latitude/longitude (of approximate center point of application) and number of acres (or linear miles, as appropriate) affected. A map identifying the area(s) of application is also acceptable for all use patterns.

III. Summary of Permit Conditions

1.0 COVERAGE UNDER THIS PERMIT

This permit covers any operator that meets the eligibility requirements identified in Part 1.1 of the permit and if so required, submits an NOI in accordance with Part 1.2 of the permit. It does not apply to the application of pesticides to areas which are "treatment works" as defined in Appendix A of the permit and to areas which are exempt from an NPDES permit per Regulation 61-9.122.3 (i.e. pollutants from non-point source agricultural and silvicultural activities (including storm water runoff from orchards, cultivated crops, pastures, range lands, and forest lands) and return flows from irrigated agriculture).

1.1. Eligibility

Only operators meeting the eligibility requirements outlined in the permit may be covered under this permit. Specifically, this permit covers the discharge of pesticides to surface waters of the State resulting from the following use patterns: (1) Mosquito and Other Flying Insect Pest Control; (2) Aquatic Weed and Algae Control; (3) Aquatic Nuisance Animal Control; (4) Forest Pest Control; (5) Intrusive Vegetation Control, and (6) Other Similar Activities. If an operator does not meet the eligibility provisions described in Part 1.1 of the permit, point source discharges to surface waters of the State from the application of pesticides will be in violation of the CWA and the PCA, unless the operator has obtained coverage under another permit.

The Pesticide General Permit (PGP) is designed to cover activities in which it is unavoidable that some of the pesticides will be deposited into water in order to effectively target the pests. This PGP does not cover spray drift resulting from pesticide applications with the exception of those use patterns that may include drift as an accepted method of application (e.g., mosquito fog trucks).

The fact sheet does not address every activity which may involve a point source discharge of pollutants to surface waters of the State that would require a permit. However, any pesticide application activities that do not fall within the use patterns covered by this permit will require coverage under some other NPDES permit if those activities result in point source discharges to surface waters of the State. The Department has given consideration to pesticide use patterns that are similar to the defined use patterns in the permit (i.e., Pesticide Use Patterns # 1-5) but not explicitly covered by those use patterns and created a sixth pesticide use pattern 'Other Similar Activities'.

More detailed discussion of the types of activities included under each of the pesticide use patterns and the permit requirements are provided in Part III.2 of the fact sheet.

1.1.2 Limitations on Coverage

1.1.2.1 Discharges to Water Quality Impaired Waters

Coverage under the PGP is only available with this general permit for certain discharges to impaired waters. For example, discharges to waters which are impaired for pollutants other than the pesticide or its degradate, are eligible for coverage. Also, discharges to waters impaired for temperature or some other indicator parameter, or for physical impairments such as "habitat alteration" are also eligible for PGP coverage. Conversely, the permit is not available for the discharge of any pesticide to water that is impaired for the specific pesticide or degradates of that pesticide.

For purposes of this permit, impaired waters are those that have been identified by the Department pursuant to Section 303(d) of the CWA as not meeting applicable State water quality standards. Impaired waters for purposes of this permit include both waters with EPA-approved and EPA-established Total Maximum Daily Loads (TMDLs) and those for which EPA has not yet approved or established a TMDL. (A list of impaired waters, along with the pollutants or pollution identified as the cause of the impairment is available at http://www.scdhec.gov/environment/water/tmdl).

1.1.2.2 Discharges to Waters Designated as Tier 3 for Antidegradation Purposes

Tier 3 waters are identified as outstanding national resource waters and generally include the highest quality waters of the U.S. Except for certain temporary changes, water quality cannot be lowered in such waters. "Temporary" is considered to be in terms of weeks or months, not years. The Tier 3 designation also provides special protection for waters of outstanding national recreational or ecological value. A list of Tier 3 surface waters of the State is available on the internet at: http://www.scdhec.gov/environment/water/regs/r61-69.pdf.

The Department believes that blanket coverage under the PGP for discharges to Tier 3 waters is inconsistent with Tier 3 anti-degradation requirements. Therefore, the Department has decided to allow these on a case-by-case basis. Operators applying pesticides that could result in discharges to Tier 3 surface waters of the State will be required to

obtain written Department approval prior to pesticide application that could result in discharges to Tier 3 surface waters of the State. The exception is in response to a "declared pest emergency situation" as defined in Appendix A of the permit. In the event of a "declared pest emergency situation", the request for coverage must be submitted no later than 30 days after the commencement of discharge. If the operator's activities are expected to be below the annual thresholds defined in Table 1 of the permit, then the request for approval may be by letter alone. Otherwise, the letter request must be accompanied by an NOI.

1.1.2.3 Discharges Currently or Previously Covered by another Permit

This Part of the PGP describes situations where an operator is ineligible for coverage under this permit because of coverage under another permit for discharges from the application of pesticides. These include discharges currently covered under an NPDES permit; discharges covered by a permit within the past five years prior to the effective date of this permit which established site-specific numeric water quality-based limitations; and discharges from activities where the associated NPDES permit has been or is in the process of being denied, terminated, or revoked by the Department (although this last provision does not apply to the routine reissuance of permits every five years).

The Department is including this last provision to be clear that it is not possible to obtain coverage by requesting termination of an individual permit and then submitting an NOI for coverage under the PGP. To avoid potential conflicts with the anti-backsliding provisions of the CWA, transfer from an individual permit to the PGP is only allowed under limited conditions, including that the individual permit did not contain numeric water quality-based effluent limits.

1.2 Authorization to Discharge Under this Permit

1.2.1 How to Obtain Authorization

To obtain authorization under the permit, operators must meet the Part 1.1 eligibility requirements and, if required by Part 1.2.2 of the permit, submit a complete and accurate NOI according to the requirements in Appendix C no later than the appropriate deadline described in Part 1.2.3.

Part 1.2.2 describes which operators are required to submit an NOI, and Table 2 sets out the timeframes within which an NOI must be submitted. An operator is required to submit an NOI if his application area exceeds or it is anticipated to exceed any applicable annual treatment area threshold during any calendar year of the permit cycle or if he does not meet the use patterns identified in Part 1.1.1.a-e of the permit and is requesting coverage under Part 1.1.1.f of the permit.

1.2.2 Operators Required to Submit a Notice of Intent (NOI)

Under Regulation 61-9.122.28 (b)(2)(v), some pesticide application operators may, at the discretion of the Department, "be authorized to discharge under a general permit without submitting a notice of intent where the Department finds that a notice of intent requirement would be inappropriate." In making such a finding, the Department must consider: "the type of discharge; the expected nature of the discharge; the potential for toxic and conventional pollutants in the discharges; the expected volume of the discharges; other means of identifying discharges covered by the permit; and the estimated number of discharges to be covered by the permit."

To reduce the burden on smaller entities, the Department's focus is on the largest applications of pesticides to surface waters of the State. All discharges authorized by this general permit involve applications made directly to surface waters of the State in order to control pests in or over the water or applications to control pests near water in which pesticides will make unavoidable contact with the water. The general permit is structured by pesticide use patterns. These use patterns were developed to include discharges that are similar in type and nature and therefore represent the type of discharges and expected nature of the discharges covered under this permit. The general permit covers the following defined use patterns:

Pesticide Use Pattern # 1: Mosquito and Other Flying Insect Pest Control
This use pattern includes the application, by any means, of chemical and biological insecticides and larvicides into or over surface waters of the State to control insects that breed or live in, over, or near water. Applications of this nature usually involve the use of ultra low volume sprays or granular larvicides discharged over large swaths of mosquito breeding habitat and may occur several times per year.

Pesticide Use Pattern # 2: Aquatic Weed and Algae Control
This use pattern includes the application, by any means, of contact or systemic herbicides to control vegetation and algae in surface waters of the State and at waters' edge. Applications of this nature may be single spot treatments of infestations or staged large scale treatments intended to clear several acres of waterway. Treatments may be singular or occur several times per year.

Pesticide Use Pattern # 3: Aquatic Nuisance Animal Control
This use pattern includes the application, by any means, of chemicals into surface waters of the State to control a range of animals for purposes such as fisheries management, invasive species eradication or equipment maintenance. Applications of this nature are usually made over an entire waterbody as the target pests are mobile. Treatments are generally made several years apart.

Pesticide Use Pattern # 4: Forest Pest Control
This use pattern includes pest control projects, in and over forests where there are surface waters of the State below the canopy. Applications of this nature usually occur over large tracts of land, and are typically made in response to specific outbreaks. The Department understands that for this use pattern pesticides may be unavoidably discharged into surface waters of the State in the course of controlling for pests that are present near or over waters. These pests are not necessarily aquatic (e.g., airborne non-aquatic insects) but are detrimental to industry, the environment, and public health. Note: The Department recognizes that mosquito adulticides may be applied to forests , in which case the application would be covered under the "Mosquito and Other Flying Insect Pest Control" use pattern.

Pesticide Use Pattern # 5: Intrusive Vegetation Control
This use pattern involves controlling vegetation along roads and utility rights-of-way and utility facilities such as pump stations, utility plants, and electric substations. Applications of this nature are usually targeting shrubs/trees or aggressive vegetation (fast-growing vines, for example) that can interfere with utility service or access to lines or equipment. Application involves techniques such as spraying by helicopter or via a backpack or truck-mounted sprayer.

The general permit also covers a sixth use pattern entitled 'Other Similar Activities' which covers applications that may result in a discharge to surface waters of the State that are similar to the use patterns discussed above but are not explicitly covered by those use patterns.

The annual (calendar year) treatment area thresholds for the five defined use patterns under this permit are defined in Table 1 (Annual Treatment Area Thresholds) of the permit.

Any operator (with the exception of an operator seeking coverage under the 'Other Similar Activities' use pattern who must submit an NOI regardless of the threshold) that has reason to believe it will exceed one or more of the annual treatment area thresholds in any calendar year of the permit cycle must submit a Notice of Intent to obtain coverage. To determine whether the pesticide application operators are required to submit an NOI, the operator must compare the total area in which the pesticide is intended to be effective multiplied by the number of times that area is treated per year.

The Department's rationale for the annual treatment area threshold for each defined use pattern is as follows:

Pesticide Use Pattern # 1: Mosquito Control and Other Flying Insect Pest Control
For Mosquitoes and Other Flying Insect Pest, the annual treatment area threshold has been set at 8,960 acres of cumulative treatment area. Typical preventive application of pesticides to control mosquitoes in SC occurs over a 7-month window, with two applications per month, for a total of 14 applications. An operator applying to a one square mile area 14 times would be at the threshold. Therefore, the Department believes it will capture the majority of operators under this use pattern by setting the threshold at 8,960 acres.

Pesticide Use Pattern # 2: Aquatic Weed and Algae Control
For Aquatic Weeds and Algae, the annual treatment area threshold has been set at 200 acres or 20 linear miles. This threshold has been set to capture operators treating relatively large portions of surface waters and watersheds, such as utilities, water management districts, state agencies, and some homeowner and lake associations.

Pesticide Use Pattern # 3: Aquatic Nuisance Animal Control
Invasive and Nuisance Aquatic Animals are most commonly treated by public agencies such as departments of fish and game or utilities such as water management districts that manage areas of surface water in excess of 20 acres. The high mobility and prolific breeding ability that necessitate control of aquatic animals usually means that their treatment most often occurs in the entirety or large portions of the water bodies they inhabit. For example, fishery management treatments using rotenone must occur in the entire lake and, thus any treatment to a lake of more than 20 acres in area will trigger the annual treatment area threshold. The Department expects that for this reason, only spot treatments to eradicate small emergent populations of sessile animals or treatments to very small water bodies might be excluded from an NOI requirement. Therefore, the Department believes the threshold appropriately captures the relatively large operators engaging in this use pattern.

Pesticide Use Pattern # 4: Forest Pest Control
Forest pest suppression programs may be designed to blanket large tracts of terrain, throughout which operators may not be able to see surface waters of the State beneath the canopy. The Department has set the annual treatment area threshold at 6,400 acres of cumulative treatment area for this use pattern with the understanding that this will exclude the smaller applications from the NOI requirement. These smaller applications generally occur on private lands. Therefore, the Department believes the threshold appropriately captures most operators engaging in this use pattern, particularly public agencies and industries managing large tracts of land.

Pesticide Use Pattern # 5: Intrusive Vegetation Control
For Intrusive Vegetation Control, the annual threshold has been set at 100 linear miles for rights-of-way applications and 100 acres of treatment area for applications occurring on the owner's property. The Department believes these thresholds will capture the utilities that are the primary users of this use pattern as well as a significant number of the municipalities.

An operator is required to submit a Notice of Intent to obtain coverage under this general permit for discharges resulting from the application of pesticides if it has reason to believe it will exceed one or more of the annual (i.e., calendar year) treatment area thresholds.

Operators that are owners are responsible for submitting an NOI if:

- Their application exceeds any applicable annual treatment area threshold, or
- Their application, in addition to any other treatments made under the owner's authority in the same calendar year, will exceed any applicable annual treatment area threshold.

Operators that are for-hire applicators applying pesticides under contract from another party will include the acreage treated on behalf of the client in their annual total.

Operators required to submit an NOI for their application must submit an NOI in accordance with Table 2 of the permit. The NOI form will allow the Department to better understand where certain discharges typically occur. When completing the NOI form, operators that are owners are asked to define the general area in which the discharge is

expected to occur and the use pattern with which the discharge is associated. For-hire applicators must specify the use pattern but are not required to specify the location of the application as this information will be included on the NOI submitted by the owner. Table 2 specifies applicable deadlines for different categories of operators to submit NOIs.

Based on a review of the NOI or other information, the Department may in certain, limited circumstances delay the authorization of the operator's discharge or may deny coverage under the permit and require submission of an application for an individual NPDES permit, as detailed in Part 1.3. The Department will notify the operator in writing (hardcopy or e-mail) of any such delay or the request for submission of an individual NPDES permit application.

Generally, an operator is not required to submit an NOI pursuant to Part 1.2.1 of the permit if no application is made in excess of any applicable annual treatment area threshold during any calendar year of the permit cycle (typically 5 years). [An exception is an owner requesting consideration for coverage under Part 1.1.1.f of the permit. These operators are required to submit an NOI regardless of the thresholds described in Table 1 (Annual Treatment Area Thresholds) of the permit.] Operators whose discharges are authorized by this permit but are not required to submit an NOI would automatically be covered under the permit for their application and would be authorized to discharge in accordance with the permit requirements as soon as the permit becomes effective. Nonetheless, the Department emphasizes that these operators would still be subject to all applicable requirements contained within the permit. If an operator, otherwise not required to submit an NOI, anticipates that he or she will exceed an applicable annual treatment area threshold during any time in a given calendar year of the permit cycle, he or she must submit an NOI at least 15 days prior to exceeding the threshold to continue to be authorized to discharge. The Department is requiring NOIs be submitted at least 15 days prior to exceeding a threshold to provide the Department with time necessary to ensure that permit coverage is appropriate for those activities identified in the NOI. If an operator wants the Department to consider alternative permit requirements for the application, the operator must apply to the Department for a substitute individual permit applicable to his or her application as required by Part 1.3 of the permit (Alternative Permits).

1.2.3 Discharge Authorization Date

Not withstanding any other conditions of the permit, for operators required to submit an NOI, the deadline for the submittal of these NOIs is sixty (60) days after the effective date of the permit. The discharge authorization date for these operators is the effective date of the permit. Beginning seventy-five (75) days after the effective date of the permit, operators are authorized to discharge under the permit consistent with Table 2 of the permit as discussed below. Table 2 specifies applicable deadlines for different categories of operators to submit NOIs. Timing for NOI submittal is based on an operator determination that they will exceed a treatment area threshold during the calendar year, not on the time when the threshold is actually exceeded. All NOIs submitted must be complete and accurate. For operators required to submit an NOI and making such a determination prior to commencement of discharge, an NOI is due at least 15 days prior to commencement of discharge and the operator shall be automatically authorized to discharge if no response is received within 10 days of the Department's receipt of the signed NOI. For operators required to submit an NOI and making such a determination after commencement of discharge (it was unexpected or unforeseen that a treatment area threshold would be exceeded for that year) an NOI is due at least 15 days prior to exceeding an annual threshold during any calendar year. In this situation, the operator's original authorization to discharge without having submitted an NOI expires when the threshold is exceeded. The operator is automatically reauthorized to discharge if no response is received within 10 days of the Department's receipt of the signed NOI. For this reason, it is important that operators in this situation submit their NOI at least 15 days before the threshold will be exceeded. For operators commencing discharge in response to a "declared pest emergency situation" (as defined in Appendix A of the permit), discharge authorization is granted immediately, but an NOI is due no later than 30 days after commencement of discharge if that discharge has exceeded a threshold. This is so that emergency response operations may be conducted without interruption. For operators requesting coverage under Part 1.1.1.f of the permit (Other Similar Activities), the NOI is due at least fifteen days prior to the expected commencement of discharge. The NOI is approved upon written notification by the Department as per Part 1.1.1.f. However, if no response is received from the Department within 10 days of the Department's receipt of the signed NOI, then the NOI is automatically approved until a written response is received from the Department. The deadlines are displayed in Table 2 (Discharge Authorization Date) of the permit.

Please note that if the Department determines that additional information regarding your discharge is necessary, you will be notified in writing (e-mail or hardcopy). Upon your receipt of the Department's written notification any automatic coverage/authorization may be suspended until the required information is received and approved by the Department. If the Department notifies you in writing (e-mail or hardcopy) that you are denied coverage under this permit, any automatic coverage/authorization is terminated at that time.

1.2.4 Continuation of this Permit

1.2.4.1 If this permit is not reissued or replaced (or revoked or terminated) prior to its expiration date, existing permittees are covered under an administrative continuance, in accordance with Regulation 61-9.122.6 provided the existing permittees reapplied in accordance with Appendix B, Subsection B.1 of the permit. This administrative continuance will last until the earliest of:

a. Your authorization for coverage under a reissued permit or a replacement of this permit;

b. The processing and posting of your Notice of Termination consistent with Part 1.2.5.1;

c. The issuance or denial of an individual permit for a discharge resulting from application of a pesticide that would otherwise be covered under this permit;

d. A formal permit decision by the Department not to reissue this general permit, at which time the Department will identify a reasonable time period for covered dischargers to seek coverage under an alternative general permit or an individual permit. Coverage under this permit will cease when coverage under another permit is granted/authorized; or

e. The Department has informed you that you are no longer covered under this permit.

Where the Department fails to reissue a final general permit prior to the expiration of a previous general permit, the Department administratively extends the permit for permittees authorized to discharge under the prior general permit provided they submitted a timely NOI (if required). For existing permittees (i.e., permittees already covered under the prior general permit) that are required to submit NOIs per Part 1.2.2 and those permittees that submitted discretionary NOIs (i.e., those permittees who remain below a threshold but submitted an NOI anyway), a timely NOI is one that is submitted at least 180 days prior to the permit expiration date (unless an extension has been granted prior to the deadline). See Appendix B of the permit, specifically Subsection B – Duty to Reapply. This requirement does not preclude a new potential discharger that is required to submit an NOI per Part 1.2.2 from obtaining coverage within that 180 day period preceding the permit expiration date or after the permit has expired.

Those that are automatically covered by this permit (i.e., those not required to submit an NOI per Part 1.2.2) and did not submit a discretionary NOI, have automatic continued coverage.

1.2.4.2 Exception to Continuing Coverage

Existing permittees covered by this permit that are required to submit an NOI per Part 1.2.2 and permittees that submitted a discretionary NOI must reapply via submittal of a new NOI at least 180 days prior to the expiration date of the permit (unless an extension has been granted by the Department prior to the deadline). Failure to do so will result in a loss of coverage if the current permit expires before the reissued permit goes into effect.

1.2.5 Terminating Coverage

1.2.5.1 Submitting a Notice of Termination (NOT)

To terminate coverage under this permit, the permittee is required under the permit to submit a NOT in accordance with information identified in Appendix D. The permittee's authorization to discharge under the permit terminates at midnight of the day that a complete NOT is processed. The requirement to submit a NOT applies only to those operators that were required to submit a Notice of Intent to obtain permit coverage and those operators that were not required to submit an NOI but did so anyway. Dischargers automatically covered under this permit as identified in Part 1.2.1 are likewise automatically terminated upon permanent cessation of discharge consistent with any of the criteria identified in Part 1.2.5.2.

The Department requires permittees to file a NOT to notify the Department that its obligation to manage pesticide discharges is no longer necessary for one of the reasons described in Part 1.2.5.2. If the Department determines that the permittee has not satisfied one of the conditions in Part 1.2.5.2 for being able to submit a NOT (e.g., the permittee continues to have a discharge), then the notice is not valid and the permittee must continue to comply with the conditions of the permit. Likewise, if the Department determines that the NOT is incomplete, the permittee may be found to be in violation of reporting requirements under Section 308 of the CWA.

1.2.5.2 When to Submit a Notice of Termination

Once all point source discharges associated with pesticide application have ceased, the permittee if he submitted an NOI, must submit a NOT, as described in Part 1.2.5.1, within 30 days after one or more of the following conditions have been met: (1) a new operator has taken over responsibility for the pest treatment; (2) operations have ceased for which permit coverage had been obtained or there will no longer be discharges from such activities, or (3) permit coverage has been obtained under an individual or alternative general permit for all discharges requiring NPDES permit coverage (unless you obtained coverage under an alternative permit consistent with Part 1.3, in which case coverage under this permit will terminate automatically once coverage under that alternative permit is obtained).

Operators that terminate coverage consistent with Part 1.3 are not required to submit a NOT.

1.2.5.3 With the exception of those operators that are not required to submit an NOI but do so anyway, operators covered under this permit that are not required to submit an NOI under Part 1.2.2 of this permit are not required to submit a NOT. These operators are terminated from permit coverage when they no longer have a discharge from the application of pesticides or their dischargers are covered under an NPDES individual permit or alternative general permit.

1.3. Alternative Permits

1.3.1 Department Requiring Coverage under an Alternative Permit

The Department may require an individual permit (in accordance with Regulation 61-9. 122.28(b)(3)(i)) or coverage under an alternative NPDES general permit instead of the PGP. The regulations also provide that any interested party may petition the Department to take such an action. The issuance of the individual permit or alternative NPDES general permit is in accordance with Regulation 61-9 Part 124 and provides for public comment and appeal of any final permit decision. The circumstances in which such an action would be taken are set forth at Regulation 61-9.122.28(b)(3)(i). The Department notes that discharges of pesticides from some vessels are already covered under the federal Vessel General Permit and do not require coverage under this general permit (see EPA NPDES Vessels General Permit at http://www.epa.gov/NPDES/vessels).

1.3.2 Operator Requesting Coverage under an Alternative Permit

After being covered by this permit, the permittee may request to be excluded from such coverage by applying for an individual permit. In this case, the permittee must submit an individual permit application in accordance with Regulation 61-9.122.28(b)(3)(iii), along with a statement of reasons supporting the request, to the Department at the address listed in Part 8.1.1 of the PGP. The request may be granted by issuance of an individual permit or authorization of coverage under an alternative general permit if the reasons are adequate to support the request. Under this scenario, if an individual permit is issued, or authorization to discharge under an alternative general permit is granted, coverage under this permit is automatically terminated under Regulation 61-9.122.28(b)(3)(iv) on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit.

Part 1.3.2 reminds permittees of their ability to apply for coverage under an individual permit in lieu of coverage under this general. Cases where an individual NPDES permit may be required, are described fully in 122.28(b)(3)(i).

The Department may require a permittee to apply for an individual permit only if the Department notifies the operator in writing that a permit application is required. This notice must include a brief statement of the reasons for this decision, an application form, a statement setting a time for the operator to file the application, and a statement that on the effective date of the individual NPDES permit the general permit as it applies to the individual permittee shall automatically terminate. The Department may grant additional time upon request of the applicant.

When an individual NPDES permit is issued to an operator otherwise subject to a general NPDES permit, the applicability of the general permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit.

Note that an individual permit or alternate general permit is required for applications of pesticides to waters impaired for that pesticide or its degradates. In these cases, authorization under this general permit would not have been available in the first place.

1.4. Severability

Invalidation of a portion of this permit does not necessarily render the whole permit invalid. The Department's intent is that the permit remains in effect to the extent possible; in the event any part of this permit is invalidated, the Department will advise the regulated community as to the effect of such invalidation.

1.5 Other Federal and State Laws

Part 1.5 of this permit includes the following language: "You must comply with all other applicable federal and state laws and regulations that pertain to your application of pesticides. For example, this permit does not negate the requirements under FIFRA and its implementing regulations to use registered pesticides consistent with the product's labeling. Additionally, there are other laws and regulations that may only apply certain activities that are also covered under this permit (e.g., U.S. Coast Guard regulations)."

This part of the permit is intended to clarify that pesticide applicators are still required to comply with other applicable laws and that merely complying with the conditions of this permit may not meet all regulations applicable to the types of activities covered under this permit.

1.6 Coastal Zone Consistency (CZC) Certification

The Department's Office of Ocean and Coastal Resource Management (OCRM) reviewed the draft permit for consistency with the Coastal Zone Management Program. Projects located in the eight (8) coastal counties (Horry, Georgetown, Berkeley, Dorchester, Charleston, Colleton, Jasper, and Beaufort) are deemed

consistent with the Coastal Zone Management Program provided that they meet the minimum criteria of this permit. The Department reserves the right to require an individual CZC determination on any project on a case by case basis.

1.7 Changes in Federal Rules

The requirements of this permit, in whole or in part as applicable, shall end if a change to federal law or regulations results in there no longer being a need for an NPDES permit for the activities regulated under this permit. The requirements shall end upon the Department's notice in the State Register.

2.0 TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Background

The federal Clean Water Act (CWA) requires that all point source discharges from existing facilities, or in this case, pesticide applications, meet technology-based effluent limitations representing the applicable levels of necessary control. Additionally, water quality-based effluent limitations (WQBELs) are required by CWA Section 301(b)(1)(C) as necessary where the technology-based effluent limitations are not sufficient to protect applicable water quality standards. Water quality-based requirements will be discussed in greater depth in Section 3 of the fact sheet. The technology-based effluent limitations contained in the PGP are non-numeric and constitute the levels of control that reduce the area and duration of impacts caused by the discharge of pesticides to surface waters of the State in a treatment area. In addition, these effluent limitations provide for protection of water quality standards, including protection of beneficial uses of the receiving waters inside the treatment area following completion of pest management activities.

Types of Technology-Based Effluent Limitations

Technology-based effluent limitations are in many cases established by EPA in regulations known as effluent limitations guidelines, or "ELGs." EPA establishes these regulations for specific industry categories or subcategories after conducting an in-depth analysis of that industry. The Act sets forth different standards for the ELGs based upon the type of pollutant or the type of permittee involved. Where EPA has not issued effluent guidelines for an industry, State permitting authorities establish effluent limitations for NPDES permits on a case-by-case basis based on their best professional judgment. See 33 U.S.C. § 1342(a)(1); Regulation 61-9.125.3(c)(2).

Department's Authority to Include Non-Numeric Technology-Based Limitations in this Permit

All NPDES permits are required to contain technology-based limitations. Regulation 61-9.122.44(a)(1) and 125.3. When EPA has not promulgated effluent limitation guidelines for an industry, or if an operator is discharging a pollutant not covered by the effluent guideline, permit limitations may be based on the best professional judgment (BPJ, sometimes also referred to as "best engineering judgment") of the permit writer. 33 U.S.C. § 1342(a)(1); Regulation 61-9.125.3(c). For this permit, the technology-based limitations are based on BPJ decision-making because no ELG applies.

Under Regulation 61-9.122.44(k)(3), non-numeric effluent limitations are authorized in lieu of numeric limitations, where "numeric effluent limitations are infeasible."

EPA interpreted the CWA to allow best management practices (BMPs) to take the place of numeric effluent limitations under certain circumstances. Regulation 61-9.122.44(k)provides that permits may include BMPs to control or abate the discharge of pollutants when: (1) "Authorized under section 304(e) of CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; (2) Authorized under section 402(p) of the CWA for the

control of stormwater discharges; (3) Numeric effluent limitations are infeasible; or (4) The practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of CWA.

Department's Decision to Include Non-Numeric Technology-Based Effluent Limitations in This Permit

As described above, numeric effluent limitations are not always feasible because the discharges pose challenges not presented by other types of NPDES-regulated discharges. The technology-based effluent limitations in this permit are non-numeric based on the following:

- The point in time for which a numeric effluent limitation would apply is not easily determinable. For discharges from the application of pesticides, the discharges can be highly intermittent with those discharges not practically separable from the pesticide application itself. For example, the discharge from the application of a chemical pesticide to a surface water of the State is represented by the residual remaining in the ambient water after the pesticide is no longer serving its intended purpose (i.e., acting as a pesticide against targeted pests in the applied medium). Chemical pesticides applied directly to water are not considered pollutants until some time after actual discharge at which point the pesticides will have performed their intended function for pest control, dissipated in the waterbody, and broken down into other compounds to some extent, etc. This discharge also will have combined with any other discharges to that waterbody (be it from other point sources, non-point source runoff, air deposition, etc). Given this situation, it is not clear what would be measured for a numeric limit or when.

- For discharges from the application of pesticides, there are often many short duration, highly variable, pesticide discharges to surface waters from many different locations for which it would be difficult to establish a numeric limitation at each location. This variability makes setting numeric effluent limitations for pesticide applications extremely difficult. In this situation, requiring the use of standard control practices (i.e., narrative non-numeric effluent limitations) provides a reasonable approach to control pesticides discharges.

- The precise location for which a numeric effluent limitation would apply is not clear. Discharges from the application of pesticide are different from discharges of process wastewater from a particular industrial or commercial facility where the effluent is more predictable and easily identified as an effluent from a conveyance (e.g., pipe or ditch), can be precisely measured for compliance prior to discharge, and can be more effectively analyzed to develop numeric effluent limitations.

- Information needed to develop numeric effluent limitations is not available at this time.

Technology-based effluent limitations in this permit are presented specific to each pesticide use pattern to reflect the variations in procedures and expectations for the use and application of pesticides. These non-numeric effluent limitations are expected to limit environmental impacts by reducing the discharge of pesticides to surface waters of the State, thereby protecting the receiving waters, including meeting of all applicable water quality standards.

Control Measures Used to Meet the Technology-Based Effluent Limitations

The Department is not mandating the specific control measures operators must implement to meet the limitations. For pesticides, namely mosquitocides, for example, Part 2.2.1.2 of the PGP requires mosquito control operators to consider mechanical/physical methods of control to eliminate or reduce mosquito habitat. How this is achieved will vary by operator: For some, this many be achieved through regular mowing while for others mowing will not be feasible. Thus, a given control measure may be acceptable and appropriate in some circumstances but not in others.

Control measures can be actions (including processes, procedures, schedules of activities, prohibitions on practices and other management practices), or structural or installed devices to prevent or reduce water pollution. The key is determining what measure is appropriate for your situation in order to meet the effluent limitation. In this permit, operators are required to implement site-specific control measures to meet these limitations. The permit along with this

fact sheet provides examples of control measures, but operators must tailor these to their situations as well as improve upon them as necessary to meet permit limits.

The Department notes that this permit uses both the term “control measures” and “best management practices” or “BMPs”. Use of the term control measure is intended to better describe the range of pollutant reduction practices that may be employed, whether they are structural, non-structural or procedural and includes BMPs as one of the components.

Implementation of Control Measures

Part 2.0 of this permit requires operators to implement control measures to meet the technology-based effluent limitations listed in that Part. It also provides operators with important considerations for the implementation of their specific control measures. Some operators will have to document how such factors were taken into account in the implementation of their control measures (See Part 5). The Department recognizes that not all of these considerations will be applicable to every site nor will they always affect the choice of control measures. If operators find their control measures are not limiting discharges of pesticide adequately, the control measures must be modified as expeditiously as practicable. See Part 6, Corrective Action.

Control Measures and Technology-Based Effluent Limitations

The non-numeric effluent limitations require operators to limit discharges of pesticide. Discharges to surface waters of the State should be reduced or eliminated through the use of control measures to the extent technologically available and economically achievable and practicable.

Statutes, Regulations, and Other Requirements

Operators must comply with all applicable statutes, regulations and other requirements including, but not limited to requirements contained in the labeling of pesticide products approved under FIFRA (“FIFRA labeling”). Although the FIFRA label and labeling requirements are not effluent limitations, it is illegal to use a registered pesticide inconsistent with its labeling. If operators are found to have applied a pesticide in a manner inconsistent with any relevant water-quality related FIFRA labeling requirements, the Department will presume that the effluent limitation to limit pesticides entering the surface waters of the State has been violated under the NPDES permit. The Department considers many provisions of FIFRA labeling -- such as those relating to application sites, rates, frequency, and methods, as well as provisions concerning proper storage and disposal of pesticide wastes and containers -- to be requirements that affect water quality. For example, an operator, who is a pesticide applicator, decides to use a mosquito adulticide pesticide product with a FIFRA label that contains the following language, "Apply this product at a rate not to exceed one pound per acre." The applicator applies this product at higher than the allowable rate, which results in excess product being discharged into surface waters of the State. The Department would find that this application was a misuse of the pesticide under the FIFRA label and because of the misuse; the Department would determine that the effluent limitation that requires the operator to limit discharges of pesticide products to surface waters of the State was also violated. Therefore, pesticide use inconsistent with certain FIFRA labeling requirements could result in the operator being held liable for CWA and PCA violations as well as a FIFRA violation.

Technology-Based Effluent Limitations in the PGP

The permit requires the operator to achieve all of the non-numeric effluent limitations delineated in Parts 2.1 and 2.2 as described below.

All operators under Part 2.1 must limit pesticide applications. Under Part 2.2, only those entities required to submit an NOI (and any pesticide applicator hired by such an entity or any other employee, contractor, subcontractor or other agent) are required to implement IPM practices and other permit conditions. The Department is not requiring these additional technology-based effluent limitation requirements from permittees who treat areas below the annual

treatment area thresholds at this time, because of concerns about potential unintended consequences of such a requirement.

2.1 Limit Pesticide Discharges to Surface Waters of the State

Part 2.1 of this permit contains the general effluent limitations that apply to *all* operators, regardless of use pattern. These effluent limitations are generally preventative in nature, and are designed to limit pesticide discharges into surface waters of the State. All operators, regardless of whether you are required to submit an NOI, are required to limit the discharge of pesticides to surface waters of the State by doing the following:

2.1.1 Use an effective amount of pesticide product per application and optimize frequency of pesticide applications necessary to control the target pest (while avoiding over-application), consistent with reducing the potential for development of pest resistance and consistent with applicable label requirements.

As noted earlier, it is illegal to use a pesticide in any way prohibited by the FIFRA labeling. Also, use of pesticides must be consistent with any other applicable state or federal laws. To limit the total amount of pesticide discharged, operators must consider lower application rates, frequencies, or both to accomplish effective control keeping in mind pesticide resistance. Using an effective amount of pesticide while avoiding over-application ensures maximum efficiency in pest control with a smaller quantity of pesticide. This also reduces the amount of pesticide available that is not performing a specific pest-control function. Using an effective amount of pesticide while avoiding over-application and optimizing the frequency of applications can result in cost and time-savings to the user. To limit discharges of pesticide, operators should base the rate and frequency of application on what is known to be effective against the target pest or necessary for resistance management.

Operators must also consider pest resistance to pesticides when reducing discharges from application of pesticide. Resistance management is an important part of pest control. Some pests can develop resistance to pesticides unless resistance management techniques are adopted by pesticide users. Resistance can result in the loss of effectiveness of pesticides with relatively favorable environmental and human health risks and increase reliance on riskier pesticides. When resistance occurs, users may increase rates and frequency of application in an attempt to maintain pesticide effectiveness. This can lead to the loss of efficacy and increased exposure to the pesticide. Pesticide applicators should be aware of the potential for pest resistance to develop by considering the pest, the pesticide and its mode of action, the number of applications and intervals, and application rates.

Pest resistance develops because intensive pesticide use kills the susceptible individuals in a population, leaving only the resistant ones to reproduce. Several pest management tactics help prevent or delay the occurrence of pesticide resistance. One tactic is to reduce dosages in order to avoid establishing a population of resistant organisms and instead allowing some survivors to pass on genes for susceptibility. Another is to apply pesticides over limited areas to reduce the proportion of the total pest population exposed to the pesticide, thereby maintaining a large pool of individuals still susceptible to the pesticide. A third tactic to prevent development of resistant pest populations is to rotate pesticides with different modes of actions against the pests rather than depend on a single mode of action. See National Pesticide Applicator Certification Core Manual, Chapter 1 – Pest Management for additional information on pesticide resistance.

2.1.2 Perform regular maintenance activities to reduce leaks, spills, or other unintended discharges of pesticides associated with the application of pesticides covered under this permit.

Common-sense and good housekeeping practices enable pesticide users to save time and money and reduce potential for unintended discharges of pesticides to surface waters of the State. Regular maintenance activities should be practiced and improper pesticide mixing and equipment loading should be avoided. When preparing the pesticides for application be certain that you are mixing them correctly and preparing only the amount of material that you need. Carefully choose the pesticide mixing and loading area and avoid places where a spill will discharge into surface waters of the State. Some basic factors operators should consider are:

- Inspect pesticide containers at purchase to ensure proper containment;
- Maintain clean storage facilities for pesticides;
- Regularly monitor containers for leaks;
- Rotate pesticide supplies to prevent leaks that may result from long term storage; and
- Promptly deal with spills following manufacturer recommendations.

2.1.3. Maintain pesticide application equipment in proper operating condition by adhering to any manufacturer's conditions, and by calibrating, cleaning, and repairing such equipment on a regular basis to ensure effective pesticide application and pest control. You must ensure that the equipment's rate of pesticide application is reasonably calibrated to deliver the appropriate quantity of pesticide needed to achieve effective control.

To limit discharges of pesticide, operators must ensure that the rate of application is calibrated (i.e., nozzle choice, droplet size, etc.) to deliver the appropriate quantity of pesticide needed to achieve effective control. Improperly calibrated pesticide equipment may cause either too little or too much pesticide to be applied. This lack of precision can result in excess pesticide being available or result in ineffective pest control. When done properly, equipment calibration can assure uniform application to the desired target and result in higher efficiency in terms of pest control and cost. It is important for applicators to know that pesticide application efficiency and precision can be adversely affected by a variety of mechanical problems that can be addressed through regular calibration. Sound calibration practices to consider are:

- Choosing the right spray equipment for the application
- Ensuring proper regulation of pressure and choice of nozzle to ensure desired application rate
- Calibrating spray equipment prior to use to ensure the rate applied is that required for effective control of the target pest
- Cleaning all equipment after each use and/or prior to using another pesticide unless a tank mix is the desired objective and cross contamination is not an issue
- Checking all equipment regularly (e.g., sprayers, hoses, nozzles, etc.) for signs of uneven wear (e.g., metal fatigue/shavings, cracked hoses, etc.) to prevent equipment failure that may result in inadvertent discharge into the environment
- Replacing all worn components of pesticide application equipment prior to application.

2.2. Integrated Pest Management (IPM) Practices (For Those Required to Submit NOIs)

As noted above, NPDES permits must contain technology-based effluent limitations. In addition to the technology-based effluent limitations described immediately above that apply to all permittees, the Department is requiring certain permittees to also comply with IPM. Permittees subject to these additional limits are those permittees who exceed the annual treatment area thresholds described in section 1.2.2.1 of the permit. (Please note that IPM is only required for those pesticide use patterns exceeding an annual threshold.) These entities are those who manage large treatment areas (as explained in Part III, section 1.2.1) and are expected to have sufficient resources to implement IPM. The Department expects that many of these permittees are already performing some of the IPM practices required in these additional technology-based effluent limitations. The Department is not requiring these additional technology-based effluent limitation requirements from permittees who treat areas below the threshold at this time because it is still unclear whether it is economically achievable for small permittees to implement IPM and because of concerns about potential unintended consequences of such a requirement, such as an inability to conduct essential public health and safety operations due to a reduction of available funds or manpower. Owners requesting coverage for "Other Similar Activities" (see Part 1.1.1.f of the permit) will be notified by the Department in writing (hardcopy or e-mail) of the requirement to implement IPM (if determined necessary). Additionally, operators whose discharges of pesticides to surface waters of the State are solely from pesticide research and development activities do not have to comply with these additional technology-based effluent limitations to the extent the limits may compromise the research design.

The additional technology-based effluent limitations in Part 2.2 are based on integrated pest management (IPM) practices. IPM, as defined in FIFRA, is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. (FIFRA, 7 U.S.C. 136r-1) IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls.

It is expected that requiring IPM practices in this permit will reduce discharges of pesticide to surface waters of the State. Part 2.2 of this permit requires operators above the annual treatment area threshold to identify the pest problem; to evaluate and implement efficiently and effectively pest management; and to properly use pesticides. Operators are required to perform each of these permit conditions prior to the first pesticide application covered under this permit and at least once each calendar year thereafter. Below is a general discussion describing the limitations for all use patterns. Following the general discussion are more detailed descriptions of each specific requirement under each use pattern. Requirements for documentation of the specific measures implemented are contained in Part 7, Recordkeeping and Reporting.

Operators required to perform IPM practices will be required to do the following regardless of use pattern.

Identify the Problem

Operators are required to identify the pest problem, identify the target pest, and establish an action threshold. Understanding the pest biology and ecology will provide insight into selecting the most effective and efficient pest management strategies (pesticidal or non-pesticidal methods), and in developing an action threshold. An action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable. In some situations, the action threshold for a pest may be zero (i.e., no presence of the pest is tolerated). This is especially true when the pest is capable of transmitting a human pathogen (e.g., mosquitoes and the West Nile virus). In areas where aquatic weeds are problematic, it may be preferable to use an aquatic herbicide as a preventive measure rather than after weeds become established. In some situations, even a slight amount of pest damage may be unacceptable for ecological or aesthetic reasons. Sometimes pre-emergent pesticide application is needed as a preventive measure to keep aquatic weeds at bay. Action thresholds can vary by pest, by site, and by season. Often the action threshold is expressed as the number of pests per unit area. Action thresholds may be difficult to establish. In a new IPM program, a practical approach is to establish an action threshold for the major pests. As operators gain insight and experience into specific pest management settings, the action levels can be revised up or down.

To identify the problem at a treatment area, operators may use existing data to meet the conditions of the permit. For example, a city may use surveillance data from an adjacent city to identify mosquito species at their pest management area. Operators may also use relevant historic site data.

Pest Management

Operators are required to implement efficient and effective means of pest management that most successfully limit discharges to surface waters of the State resulting from the application of pesticides. Operators must evaluate both pesticide and non-pesticide methods. Operators must consider and evaluate the following options: no action, prevention, mechanical/physical methods, cultural methods, biological control agents, and pesticides. In the evaluation of these options, operators must consider impacts to water quality, impacts to non-target organisms, pest resistance, feasibility, and cost effectiveness. Combinations of various management methods are frequently an effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. For additional information, see discussion under each use pattern.

Pesticide Use

Operators are required to conduct pest surveillance and reduce the impact on the environment. Pest surveillance is important to properly time the need for pest control. To reduce the impact on the environment and non-target organisms, operators are required to apply pesticide when the action threshold has been met. As noted earlier, action thresholds help determine both the need for control actions and the proper timing of such actions. There are additional requirements designed for each use pattern in Sections 2.2.1 through 2.2.4 of the permit. For additional information and other limits on pesticide use, see specific discussion under each use pattern.

2.2.1 IPM for Pesticide Use Pattern # 1: Mosquito and Other Flying Insect Pests Control

a. Mosquitoes

Background

There are over 2500 different species of mosquitoes throughout the world with approximately 200 species occurring in the U.S. The total budgets for mosquito control in the U.S. exceed $200,000,000 annually (AMCA 2009). Mosquitoes can be a source of annoyance (e.g., work and leisure activities), a limiting factor in economic development (e.g., residential development and property value), a causal factor in decreased agricultural productivity (e.g., animal weight loss/death and decreased milk production) from irritation and blood loss, and a source of disease transmission (e.g., malaria, encephalitis, yellow fever, dengue, and West Nile Virus). Most of these diseases have been prominent as endemic or epidemic diseases in the U.S. in the past, although today, only the insect-borne (arboviral) encephalitides and West Nile virus fever occur annually and dengue occurs periodically in this country. Thus, control of mosquitoes is an important public health issue. Numerous strategies are used to reduce the impact of mosquitoes but a comprehensive approach using a variety of complementary control methods is necessary for any mosquito control program.

Of major concern is the transmission of microorganisms that cause diseases such as western equine encephalitis and St. Louis encephalitis. Both of these diseases can cause serious, sometimes fatal neurological ailments in people. (Western equine encephalitis virus also causes disease in horses.) Western equine encephalitis infections tend to be more serious in infants while St. Louis encephalitis can be a problem for older people. These viruses normally infect birds or small mammals. During such infections, the level of the virus may increase in these infected animals facilitating transmission to humans by mosquitoes. The West Nile virus, which can also cause encephalitis, was found in the northeastern U.S. for the first time in 1999, and is a good example of this mode of transmission. Over 20,000 human cases of West Nile virus have been reported in the U.S. Symptoms of human illness can range from mild flu-like symptoms to severe encephalitis, meningitis, or acute flaccid paralysis. Over 800 people have died from West Nile virus since its emergence in North America in 1999 (CDC).

Other pathogens transmitted by mosquitoes include a protozoan parasite which causes malaria, and *Dirofilaria immitis*, a parasitic roundworm and the causative agent of dog heartworm. Disease carrying mosquito species are found throughout the U.S., especially in urban areas and coastal or inland areas where flooding of low lands frequently occurs. Even when no infectious diseases are transmitted by mosquitoes, they can be a health problem to people and livestock. Mosquito bites can result in secondary infections, allergic reactions, pain, irritation, redness, and itching.

Mosquito Control IPM Practices

Identify the Problem

Part 2.2.1.1: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must do the following for "pest management areas", as defined in Appendix A. Operators must identify the pest problem in their pest management area prior to the first application

covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year.

Establish densities for larval and adult mosquito or flying insect pest populations to serve as action threshold(s) for implementing pest management strategies, recognizing that public health emergencies may require alternative methods. Operators must develop action thresholds for larval and adult mosquito prior to the first pesticide application covered under this permit. The action thresholds must be re-evaluated at least once each calendar year. As noted in the general discussion above, an action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable. For larvae control, action thresholds are determined by standard mosquito dipping techniques. The larvae density action threshold can be used to determine how much larval control products are to be used or even if any action is to be taken. In some situations, the action threshold for a pest may be zero (i.e., no presence of the pest is tolerated). This is especially true when the pest is capable of transmitting a human pathogen (e.g., mosquitoes and the West Nile virus). Note that the definition of Action Threshold in Appendix A of the permit takes into account the concept of preventative applications.

Identify the target mosquito or flying insect pest species to develop a species-specific or breeding habitat pest management strategies based on developmental and behavioral considerations for each species. Knowledge of the developmental biology of mosquitoes is essential to developing pest management strategies for mosquito control. The mosquito undergoes complete metamorphosis and has four distinct stages in its life cycle: egg, larva, pupa, and adult. Depending on the species, eggs are deposited either in permanent water habitats or in temporary/floodwater habitats. Egg deposition in permanent water habitats occurs as individual eggs or as multiple egg rafts deposited directly to the water surface in natural or artificial water-holding containers found in the domestic environment or in naturally occurring pools. Egg rafts may contain 100-200 eggs. A batch laid of single eggs may range from 60-100 eggs. Egg deposition in temporary/floodwater habitats occurs as individual eggs on moist soil (e.g., roadside ditches, depressions, farmland irrigation ditches, etc.) or in other objects (e.g., flower pots, cans, tires, tree holes, etc.) in which periodic flooding will occur. Eggs deposited in permanent habitats will hatch in a few days whereas eggs deposited in temporary/floodwater habitats are resistant to desiccation in the absence of flooding and can withstand drying for extended periods of time (weeks to months) before hatching.

Following egg hatching, typically 2-3 days after laying, mosquitoes go through four larval developmental stages (instars) commonly known as wrigglers. Larval development generally is completed in a week or less, depending upon the species and environmental conditions (e.g., crowding, food availability, and water temperature). The first three larval instars continually feed on detritus, algae, bacteria, and fungi. However, some mosquito species are predacious with larva feeding on other mosquitoes and/or small aquatic invertebrates. Late in the fourth larval instar the larvae ceases to feed in preparation for pupation. The pupal stage, commonly referred to as a tumbler, is a non-feeding developmental stage in which the adult form is developed. Following a few hours to several days, dependent upon species and water temperature, the adult emerges from the pupae.

The adult mosquito is the pestiferous stage. Adults emerge from the water surface and after a short period of rest seek out a food source. Both males and females feed on nectar of flowers and other sugar sources as a source of energy. Only female mosquitoes seek out a blood meal as a source of protein and lipids for egg development. However, females of some species are autogenous (i.e., able to use energy reserves carried over from the immature stage to develop the first egg batch). In addition, most mosquitoes have preferred hosts which may include warm and cold blooded animals and birds. Human blood meals are seldom first or second choices with livestock, smaller mammals and/or birds generally preferred. Host seeking and blood feeding activities by mosquitoes are initiated by a complex variety of host and environmental cues (e.g., carbon dioxide, temperature, moisture, smell, color, movement and host preference). Adult feeding activity is generally either crepuscular (early morning, dusk and into the evening) or diurnal (daytime, particularly in relation to cloudy days and shaded areas). Although highly variable by species and

environmental conditions, a complete development cycle can occur every one to three weeks. An understanding of the developmental biology of species in a given area provides the basis for developing a pest management strategy aimed at reducing pesticide discharge into surface waters of the State.

Prior to the first pesticide application covered under this permit, operators must ensure proper identification of mosquito species to better understand the biology of the target species and develop a detailed pest management strategy. Due to the great variability in developmental habitats and adult feeding behaviors as discussed previously, proper identification is imperative in designing an effective and efficient pest management strategy. Identification of the target species will aid in development of strategies aimed at both the immature and adult developmental stages. Identification of the target species for a specific area allows 1) identification of potential breeding sites, 2) evaluation of alternative control measures aimed at controlling the immature stages (habitat modification, source reduction, larvicides, biological larvicides, and oils), and 3) assessment of potential for disease transmission.

Identify known breeding sites for source reduction, larval control program, and habitat management. Once species have been identified, mapping is a valuable tool in assessing mosquito habitats and designing control programs for a specific area to limit pesticide discharge into surface waters of the State. Maps may simply be township/city/county maps but may also include aerial photo assessments, topographic maps, and satellite imagery where available. Mapping is essential to identify mosquito-producing areas which can and cannot be controlled using non-chemical preventative measures (e.g., source reduction). Maps should include all potential sites for mosquito development including agricultural areas in the specific area (e.g., hay, pasture, circle irrigation, orchards, rill irrigated field crops, and flood irrigated pastures and farmland). Mapping should also be a priority in a surveillance program utilizing mosquito traps, biting counts, complaints, and reports from the public. Planning in coordination with mapping ensures the best pest management strategy (whether source reduction, biological, or chemical) for each particular species is chosen. Operators must identify known breeding sites prior to the first pesticide application covered under this permit.

Analyze existing surveillance data to identify new or unidentified sources of mosquito or flying insect pest problems as well as sites that have recurring pest problems. As discussed above, mapping is a valuable tool in assessing mosquito habitats and designing control programs. Operators must analyze existing surveillance data to identity any new source of mosquito problems.

In the event there are no data for your pest management area in the past calendar year, see Part 5 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in Part 2.2.1.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Part 2.2.1.2: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement, for pest management areas, efficient and effective means of pest management. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical or physical methods; Cultural methods; Biological control agents; and Pesticides.

Operators are required to evaluate and implement a pest management strategy to limit pesticide discharge (as per Part 2.1 of the permit) into surface waters of the State prior to the first pesticide application covered under this permit. Pest management strategies will vary by locality, mosquito species, and financial concerns. As noted above, combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Operators must reevaluate every year prior

to the first pesticide application for that calendar year. The following describes the management options that must be evaluated.

No Action. No action is to be taken, although a mosquito problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified or no control methods exist.

Prevention. Prevention strategies are program activities which eliminate developing mosquito populations through environmental modification and/or habitat management. For mosquito control, these activities are physical methods such as habitat modification, cultural methods that reduce sources of mosquitoes, and biological control.

Mechanical or Physical Methods. Habitat modification, also known as physical or permanent control, is in many cases the most effective mosquito control technique available and is accomplished by eliminating mosquito breeding sites. Habitat modification activities have the potential to be both effective and economical in some areas and can virtually eliminate the need for pesticide use in and adjacent to the affected habitat. However, the ability to use prevention strategies is dependent upon local authority and restrictions.

Cultural Methods. Cultural methods can reduce sources of mosquitoes and can be as simple as properly discarding old containers that hold water capable of producing *Aedes aegypti*, *Ae. albopictus* or *Culex spp*. or as complex as implementing Rotational Impoundment Management (RIM) or Open Marsh Water Management (OMWM) techniques. RIM is a source reduction strategy that controls salt marsh mosquitoes (e.g., *Ae. taeniorhynchus* and *Ae. sollicitans*) at the same time as significant habitat restoration is occurring. Source reduction may include; water management, vegetation management, biological control, and pesticide use in non-waters of the State.

Containers provide excellent habitats for development of numerous mosquito species. These may include but are not limited to flowerpots, cans, and tires. Container-inhabiting mosquitoes of particular concern include, *Ae. aeypti*, *Ae. albopictus, Cx. p. pipiens,* and *Cx. salinarious*. A container-breeding mosquito problem can be solved by properly disposing of such materials, covering them, tipping them over to ensure that they do not collect water, and/or periodic draining. Urban container-breeding mosquito control is best implemented through education and surveillance programs.

Source reduction in freshwater lakes, ponds, and retention areas is more applicable to artificially created areas than natural areas. Artificial ponds can be eliminated as a breeding site simply by filling in the areas, (i.e., habitat modification). However, large permanent water bodies and areas for stormwater or wastewater retention require other methods. Options for these areas include reducing and/or eliminating emergent and standing vegetation, maintenance of steep banks, and inclusion of deep water areas as sanctuary for larvivorous fish.

Mosquito production from stormwater/wastewater habitats can result in considerable mosquito problems as a result of engineering, poor construction or improper maintenance. However, mosquito populations can typically be managed by keeping such areas free of weeds through an aquatic plant management program and maintaining water quality that can support larvivorous fish. *Culex*, *Coquillettidia*, *Mansonia*, and *Anopheles* mosquitoes are often produced in these habitats.

Pastures and agricultural lands are enormous mosquito producers, frequently generating huge broods of *Aedes*, *Psorophora*, and *Culex* mosquitoes. Improved drainage is one effective tool for source reduction in such habitats. The second is the use of efficient, precision irrigation practices that will result in less standing water for those agricultural areas that require artificial watering.

In coastal areas with extensive coastal salt marshes, there can be tremendous production of *Aedes* mosquitoes, making coastal human habitation virtually impossible. Several source reduction efforts can greatly reduce salt-marsh mosquito production through high-to mid-intensity management that relies upon artificial manipulation of the frequency and duration of inundation.

Biological Control Agents. The use of biological organisms or their byproducts to combat pest insects, such as mosquitoes, is termed biological control, or biocontrol. Biocontrol is utilization of parasites, predators, and pathogens to regulate pest populations. Generally, this definition includes natural and genetically modified organisms and means that the agent must be alive and able to attack the mosquito. The overall premise is simple: Biocontrol agents that attack mosquitoes naturally are grown in the lab and then released into the environment, usually in far greater numbers than they normally occur, and often in habitats that previously were devoid of them, so as to control targeted mosquito species.

One advantage of biocontrol agents is host-specificity which affords minimal disturbance to non-target species and to the environment. However, it is this specificity and the cost of commercializing biocontrol agents that deter development of biocontrol agents. In addition, utilization of biocontrol requires increased capital outlay and start up costs as well as increased training requirements for personnel.

Biocontrol should be considered a set of tools that a mosquito control program can use when it is economically feasible. When combined with conventional chemicals and physical control procedures, biocontrol agents can provide short and, occasionally, long-term control. Biocontrol, as a conventional control method, should aim at the weakest link of the life cycle of the mosquito. In most cases, this is the larval life stage.

Mosquitofish (*Gambusia affinis*) are currently the most extensively used biocontrol agent. These fish, which feed on mosquito larvae, can be placed in a variety of permanent and semi-permanent water habitats. Differences of opinion exist on the utility and actual control benefits derived from *Gambusia* implementation in an Integrated Pest Management (IPM) program with results reported from excellent control to no control at all. Recently, concerns over placing *Gambusia* in habitats where other fish species assemblages are threatened have arisen. Care must be taken in placement of this cosmopolitan species in areas where endemic fish species are sensitive to further environmental perturbation. Additionally, use of endemic fish species in these areas of concern deserves greater attention.

In some aquatic habitats, fish function as an excellent mosquito biocontrol mechanism. These typically are permanent habitats where *Culex* and *Anopheles* are the primary mosquito residents and where the mosquito densities are not excessive. However, in habitats such as salt marshes fish are unable to control the sudden explosion of larvae produced by rainfall or rising tides. Here, the mosquito population numerically exceeds what the fish can consume during the brief immature mosquito developmental period. In salt marshes, fish must rely on things other than mosquito larvae for their nutritional needs most of the time, simply because there may be long delays between hatches of larvae. Mosquito larvae present an abundant food source, but only for a few days during their rapid development.

Species of predacious mosquitoes in the genus *Toxorhynchites* have been studied in a variety of urban areas for control of container-inhabiting mosquitoes, such as the Asian tiger mosquito (*Ae*. *albopictus*). *Toxorhynchites* mosquitoes also affect mosquito populations that develop in the treehole environment; however, their introduction into urban container habitats has proven unsuccessful.

In specific containers, *Toxorhynchites* may consume a large number of prey mosquito larvae, such as *Aedes aegypti* and *Ae*. *albopictus*. However, this predator does not disperse well enough to impact the vast number of natural and artificial containers used by these mosquitoes. Additionally their life-cycle is 2-3 times that of their prey making it impossible for them to keep up with the other more rapidly developing mosquitoes.

Another group of biocontrol agents with promise for mosquito control is the predacious copepods (very small crustaceans). Copepods can be readily mass reared, are easily to delivered to the target sites, and perform well when used with insecticides.

Birds and bats are often promoted as potential biocontrol agents of adult mosquitoes. However, while both predators eat adult mosquitoes, they do not do so in sufficient amounts to impact the mosquito populations. Mosquitoes provide such a small amount of nutrition that birds or bats expel more energy pursuing and eating mosquitoes than they derive from them. They are not a primary food source for these predators. Additionally, with mosquito flight behavior being

crepuscular they are not active during the feeding periods of most birds. While bats are active during the correct time period, they simply cannot impact the massive numbers of adult mosquitoes available.

Bio-rational products exploit insecticidal toxins found in certain naturally occurring bacteria. These bacteria are cultured in mass and packaged in various formulations. The bacteria must be ingested by mosquito larvae so the toxin is released. Therefore bio-rational products are only effective against larvae since pupae do not feed. The bacteria used to control mosquito larvae have no significant effects on non-target organisms. The possibility of creating a new invasive species by the introduction of biocontrols should be considered, evaluated, and avoided.

Pesticides. There are chemical and biological pesticide products registered for use against mosquitoes. Two biological pesticide products that are used against mosquito larvae singly or in combination are *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (Bs). Manufactured Bti contains dead bacteria and remains effective in the water for 24 to 48 hours; some slow release formulations provide longer control. In contrast, Bs products contain live bacteria that in favorable conditions remain effective for more than 30 days. Both products are safe enough to be used in water that is consumed by humans. In addition to the biological pesticides, there are chemical pesticides for use against mosquitoes. As described below, once the determination is made to use pesticides to control mosquitoes, additional requirements under this general permit must be met.

Pesticide Use

Conduct larval and/or adult surveillance prior to each pesticide application (unless its preventative application – see definition of Action Threshold in Appendix A) to assess the pest management area and to determine when action threshold(s) are met that necessitate the need for pest management. Pest surveillance is important for timing pest control properly and to evaluate the potential need for pesticide use for mosquito control. Understanding surveillance data may enable mosquito control operators to more effectively target their control efforts. Operators are required to conduct a surveillance program to limit discharges from control activities. Surveillance is necessary not only to establish species' presence and abundance but also as an evaluation tool of the effectiveness of source reduction and chemical control activities. Furthermore, surveillance should be used as an indicator of the need for additional chemical control activities based on pre-established criteria related to population densities in local areas.

Larval surveillance involves routine sampling of aquatic habitats for developing mosquitoes. The primary tools used to determine larval densities and species composition are a calibrated dip cup and/or a bulb syringe for inaccessible areas such as treeholes. The counts may be expressed as the number of immature (larvae and pupae) mosquitoes per dip, per unit volume, or per unit surface area of the site. However, due to natural mortality from environmental factors, disease and predators, larval dip counts do not provide an accurate indication of the potential adult population. Nevertheless, larval counts do indicate when chemical larval control measures are warranted.

Adult surveillance is a key component of any mosquito control program. Adult surveillance can be conducted using CDC traps, New Jersey light traps, resting site traps, egg oviposition traps, vehicle traps, and landing count rates. Mosquito control operators should use a variety of the available traps as adults are attracted to different traps depending on their species, sex, and physiological condition. Trapped adults provide information about local species composition, distribution, and density. In addition, the need for adulticide application may also be established through the number and distribution of service requests received from the public. Collection data also provide feedback to the mapping and planning component of the IPM program as well as to its effectiveness and also serve to identify new sources of mosquitoes or identify recurring problem sites.

Disease surveillance, where practical, is also a key component of a pest management strategy. Detecting antibodies in "sentinel" chicken flocks, equine cases, and testing dead birds and adult mosquitoes for infections are all used to determine whether disease is being transmitted in an area. Mosquito and vector control agencies also may test mosquitoes for viruses in their laboratories. Although generally less sensitive than sentinel chickens, mosquito infections may be detected earlier in the season than chicken seroconversions and therefore provide an early warning of virus activity. However, disease surveillance is not applicable to all mosquito control programs. In the absence of a

dedicated disease surveillance program, mosquito control operators should stay informed of arboviral occurrence or potential for occurrence in their control areas as determined by local, state, and/or national public health agencies.

Assess environmental conditions (e.g. temperature, precipitation, and wind speed) in the treatment area prior to each pesticide application to identify whether existing environmental conditions support development of pest populations and are suitable for control activities. Environmental conditions also may affect the results of adulticide application. Wind determines how the ULV droplets will be moved from the output into the treatment area. Conditions of no wind will result in the material not moving from the application point. High wind, a condition that inhibits mosquito activity, will quickly disperse the insecticide over too wide an area but at a diluted rate too low to effectively control pests. Light wind conditions (< 10 mph) are the most desirable because they move the material through the treatment area and are less inhibiting to mosquito activity. Thermal fogs perform best under very light wind conditions.

ULV application should be avoided during hot daylight hours. Thermal conditions, particularly temperature inversion, will cause the small droplets to quickly rise, moving them away from mosquito habitats. Generally, applications are made after sunset and before sunrise, depending upon mosquito species activity. Some mosquitoes (*Culex* and *Anopheles*) are most active several hours after sunset, while others (*Ae*. *aegypti* and *Ae*. *albopictus*) are more active during the daytime, and if these species are the targets, application should be made during the period of highest activity for the target species, provided that meteorological conditions are suitable for application (seldom during daylight hours).

One notable exception to treatments made when mosquitoes are up and flying is a residual barrier treatment application. Barrier treatments are based on the natural history and behavioral characteristics of the mosquito species causing the problem. Barrier applications use a residual material and are generally applied with a powered backpack sprayer to preferred resting areas and migratory stops in order to intercept adult mosquitoes hunting for blood meals. Barrier treatments are often applied during daylight hours as a large-droplet liquid application and are designed to prevent a rapid re-infestation of specific areas, such as recreational areas, parks, special-event areas, and private residences. Barrier applications can help provide control of nuisance mosquitoes for up to one week or longer.

Reduce the impact on the environment and on non-target organisms by applying the pesticide only when the action threshold has been met. Operators must apply pesticide only as indicated by action thresholds for the pest management area. As noted above, action threshold, established by the operator, help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

In situations or locations where practicable and feasible for efficacious control, use larvicides as a preferred pesticide for mosquito or flying insect pest control when larval action thresholds have been met. Operators may use larvicides, adulticides or a combination of both. However, when practicable and feasible, larviciding should be the primary method for mosquito control. Larviciding is a general term for the process of killing mosquitoes by applying natural agents or manmade pesticide products designed to control larvae and pupae (collectively called larvicides) to aquatic habitats. Larviciding uses a variety of equipment, including aerial, from boats, and on the ground, as necessitated by the wide range of breeding habitats, target species, and budgetary constraints. Applications can be made using high pressure sprayers, ULV sprayers, handheld sprayers, and back sprayers. However, larviciding is only effective when a high percentage of the mosquito production sites are regularly treated, which may be difficult and expensive.

There are advantages and disadvantages to aerial and ground larvicide treatments. Ground larviciding allows application to the actual treatment area and consequently to only those micro-habitats where larvae are present. Therefore, ground larviciding reduces unnecessary pesticide load on the environment. However, ground applications often rely on in-the-field human estimates of the size of treatment areas and equipment output with a greater chance of overdosing or under-dosing. Ground larviciding is also impractical for large or densely wooded areas and exposes applicators to greater risk of insecticide exposure.

Aerial larviciding application methods are generally used for controlling mosquito larvae present in large areas and areas that are inaccessible for ground application. However, failure to treat an entire area with good larvicide coverage can result in the emergence of large adult populations. In order to prevent poor site coverage, a global positioning system (GPS), where economically feasible, or site flagging are necessary to increase accuracy of the treatment coverage while reducing the amount of larvicides being applied. Aerial application does provide easier calibration of equipment due to the fact that the target area is generally mapped and the material is weighed or measured when loading. However, cost of aerial application is higher than ground application (i.e., additional personnel for flagging or expensive electronic guidance systems) and also requires special FAA licenses, training of staff, and additional liability insurance. In addition, aerial larviciding has greater potential for non-target impacts.

In situations or locations where larvicide use is not practicable or feasible for efficacious control, use adulticides for mosquito or flying insect pest control when adult action thresholds have been met. Chemical treatment for adult mosquitoes, adulticiding, is the most visible and commonly used form of mosquito control. Adulticide applications may be used for nuisance or disease vectoring mosquitoes. Adulticiding consists of dispersing an insecticide as a space spray into the air column, using ground or aerial equipment, which then remains suspended in the air column through the habitat where adult mosquitoes are flying. Any mosquito adulticiding activity that does not follow reasonable guidelines, including timing of applications, avoidance of sensitive areas, and strict adherence to the pesticide label, risks affecting non-target insect species.

Operators must ensure that the adulticide applications are made only when necessary by determining a need in accordance with specific criteria that demonstrate a potential for a mosquito-borne disease outbreak, or numbers of disease vector mosquitoes sufficient for disease transmission, or a quantifiable increase in numbers of pestiferous mosquitoes. To determine the need for adulticide application, at least one of the following criteria should be met and documented by records: 1) when a large population of adult mosquitoes is demonstrated by either a quantifiable increase in, or a sustained elevated mosquito population level as detected by standard surveillance methods, 2) where adult mosquito populations build to levels exceeding community standards (e.g., 25 mosquitoes per trap night or 5 mosquitoes per trap hour during crepuscular periods), and/or 3) when service requests for arthropod control from the public have been confirmed by one or more recognized surveillance methods.

The most common forms of adulticiding are ultra-low volume spray (ULV) and thermal fogging. Ground adulticiding is almost exclusively conducted with ULV equipment and is the most common method used to control mosquitoes. Ground adulticiding can be a very effective technique for controlling most mosquito species in residential areas with negligible non-target effects.

Aerial adulticiding is a very effective means of controlling adult mosquitoes, particularly in inaccessible areas, and may be the only means of covering a very large area quickly in case of severe mosquito outbreaks or vector borne disease epidemics. Aerial adulticide applications are made using either fixed wing aircraft or rotor-craft. Application is generally as ULV spray but some thermal fogging still occurs.

Adulticide application has its own set of conditions that determine success or failure. The application must be at a dosage rate that is lethal to the target insect and applied with the correct droplet size. Whether the treatment is ground or aerially applied, it must distribute sufficient insecticide to cover the prescribed area with an effective dose. Typically with ground applications, vegetated habitats may require up to three times the dosage rates that open areas require. This is purely a function of wind movement and its ability to sufficiently carry droplets to penetrate foliage. In addition, aerial application is dependent upon favorable weather conditions.

Recommended Mosquito Control References

EPA recommends the following sources for additional information on IPM's and BMP's for mosquito control.

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b. Other Flying Insect Pest Control (Black Flies Example)

Black Flies – Background

There are 1800 species of black flies throughout the world with approximately 254 species in North America alone. Black flies can be 1) a source of annoyance to people, animals, and wildlife, 2) a limiting factor in economic development (e.g., residential development and property value), and 3) a causal factor in decreased agricultural productivity (e.g., animal weight loss/death and milk production). Black fly control in the U.S. provides economic, health and quality of life benefits. In contrast to the integrated approach used for mosquito control, due to its unique biology, black fly control in the U.S. is primarily through the use of larvicides.

Black Flies - IPM Practices

Identify the Problem

Part 2.2.1.1: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must do the following for "pest management areas", as defined in Appendix A. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year. Operators are required to fulfill problem identification requirements to limit discharges to surface waters of the State in black fly control operations. Identification includes: (1) black fly biology, (2) local developmental habitats, (3) avoidance methods, and (4) the benefits and risks of chemical use as a pest management strategy.

Black flies, commonly referred to as buffalo gnats, are the smallest of the blood feeding dipterans. Worldwide, blackflies are responsible for transmitting ochocerciasis (river blindness) to millions of people in tropical areas. Black flies can also vector bovine onchocerciasis, mansonellosis, and leucoytozoonosis in wild and domestic animals. While generally only considered nuisance pests in the U.S., epidemiological research has demonstrated that black flies are competent vectors of vesicular stomitis and suggests that these pests may be responsible for periodic outbreaks of this disease in livestock, wildlife, and humans in the western U.S. However, flies may also become so abundant as to be drawn into the air passages of livestock, occasionally resulting in death. Black fly feeding activity may also result in allergic reaction in both animals and man as a result of histaminic substances in black fly saliva.

Establish densities for larval and adult mosquito or flying insect pest populations to serve as action threshold(s) for implementing pest management strategies, recognizing that public health emergencies may require alternative methods. Operators must develop action thresholds for black flies prior to first pesticide application covered under this permit. The action thresholds must be re-evaluated at least once each calendar year. As noted in the general discussion above, an action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable.

Identify target mosquito or flying insect pest species to develop species-specific pest management strategies based on developmental and behavioral considerations for each species. The life cycle for black fly includes four stages: egg, larva, pupa, and adult. All are aquatic except the adults, which leave the water to search for food and mates. Black fly immatures have three general life history strategies. One group of species produces 1 generation per

year (univoltine) that matures in late winter or early spring. A second group is also univoltine, but these species develop during late spring or summer. The third and final group of species produces 2 or more generations per year (bivoltine or multivoltine) that typically develop from early summer through fall.

Adult females deposit from 150 to 500 eggs in flowing water. Flowing water habitats capable of black fly production range from a 4-inch trickle to large rivers. Egg-laying occurs near dusk for many species. The eggs are dropped singly from the air or deposited in masses on trailing vegetation, rocks, debris and other substrates. Eggs hatch in 2 days to 8 months, depending on black fly species and water temperature. Incubation time in some species is delayed by a prolonged diapause, or resting period. Eggs of many species can successfully withstand temperature extremes, fluctuating water levels, and desiccation associated with alternating flood and drought conditions during seasonal changes. Many species overwinter in the egg stage, but a few black flies spend the winter months as larvae and pupae, or rarely, as adults.

Larvae anchor themselves to clean vegetation, rocks, or debris by spinning a small silken pad with their mouthparts and inserting a row of hooks at the end of their enlarged abdomen into the silk pad. This technique allows the larvae to secure themselves in areas of very fast water velocity and orient their body with the abdomen pointed upstream, and head positioned downstream to feed. Larvae can easily relocate to other areas by drifting downstream on a silken thread, spinning a new silk pad, and reattaching themselves in areas with more acceptable substrates or food supplies. Feeding is accomplished by expanding a pair of fan-like structures on their hardened head capsule to efficiently filter microscopic food particles from the water column. The larvae filter or scrape very fine organic matter, filamentous algae, bacteria and tiny aquatic animals from the current or substrates. Larvae are often infected with various parasites and pathogens, including nematode worms, bacteria, fungi, protozoa and viruses.

Larval instars vary from 4 to 9, depending on species, with many species passing through an average of 7 instars. Larval development time varies from 1 week to 6 months depending on species, water temperature, stream turbidity and food availability. Larval growth is very temperature dependent, with relatively slow growth during the cold winter months and very rapid growth during warm summer water temperatures. Some summer-developing, multivoltine species are capable of completing their entire life cycle in just a few weeks. Mature larvae, with fully developed respiratory filaments visible as a dark area on each side of the thorax, stop feeding, and construct a silken pupal cocoon where metamorphosis takes place.

Pupae secure themselves inside their cocoons with rows of spine-like hooks on their abdomen. The tightly woven or loose cocoons, characteristically shaped for each species, are attached to substrates with the closed end facing upstream to protect pupae from current and sediments. Some species have a lateral aperture, or window, on each side of the cocoon to increase water circulation around the pupa. The branched respiratory organs that project from the pupal thorax are designed to function in or out of water. This adaptation allows pupae to obtain oxygen at all times, and survive normal fluctuations in water levels. The pupal stage may last from 2 days to several weeks depending on the species and water temperature.

Adults emerge from the pupal skin through an elongate slit at the top of the thorax and ride a bubble of air that propels them to the water surface. Freshly emerged adults fly to streamside vegetation where their wings and bodies quickly dry and harden. Mature adults immediately seek food sources and mates. Both sexes feed on nectar, sap, or honeydew to obtain the sugar used for flight and energy. Only females feed on blood. In most species, mating takes place in flight, with females flying into male swarms that form over landmarks such as waterfalls, vegetation or host species. Males utilize their large eyes to detect and seize females entering the swarm. Male and female pairs exit the swarm, and mating takes place in flight in just a few seconds. Females then seek a host to obtain the blood meal required to nourish their eggs. Adults are strong fliers, capable of dispersing many miles from their larval habitats.

Black fly females are attracted to their specific hosts by size, shape, color, carbon dioxide, body odor, body movement, skin texture, temperature and humidity. Females use their mouthparts to cut, or lacerate the host skin, and then drink from the resulting pool of blood. Anticoagulants in the saliva are injected into the bite to facilitate bleeding. Many domestic and wild animals have been killed by outbreaks of adult black flies. Deaths have been attributed to acute

toxemia from large numbers of bites, anaphylactic shock, and weakness due to blood loss. In humans, lesions can develop at the bite, accompanied by reddening, itching, and swelling. In severe cases, allergic reactions may occur, resulting in nausea, dizziness, and fever.

Host specificity in black flies varies from highly specific species that will feed on blood from only 1 host, too much more generalized species that will draw blood from a number of different hosts. Although host preferences for many North American black flies are poorly understood, it is estimated that 67% feed on mammals and 33% feed on birds. Approximately 10% of North American species will feed on the blood of humans.

Prior to first pesticide application covered under this permit, operators must ensure proper identification of black fly species to develop a detailed pest management strategy. Due to preferred hosts and developmental habitats, proper identification of the pest species is instrumental in determining the biology (univoltine or multivoltine), and developmental habitat preference (e.g., flow rate, stream size, stream substrate composition), and flight range of the target species. By knowing these factors, a control program can 1) determine if the black fly species warrants control activities (i.e., host preference and historical problems), 2) identify habitats and delineate the potential area for ongoing monitoring and control activities, 3) determine frequency of site monitoring, 4) estimate timing for pesticide application (i.e., historical seasonal occurrence, age distribution of susceptible immature population, environmental conditions suitable for control activity, etc.), 5) reduce discharge of pesticides into surface waters of the State.

Identify known breeding sites for source reduction, larval control program, and habitat management. In conjunction with species identification, mapping should be considered part of control programs aimed at black fly management. Maps may simply be township/city/county maps but may also include aerial photo assessments, topographic maps, and satellite imagery where available and/or practicable. Mapping is essential to identify areas of flowing water which are suitable for production of the target species. As black flies are strong fliers and will travel great distance to obtain a blood meal, mapping should be for an extended area from the site to be protected by control activities. Species identification and mapping should also be a priority in a surveillance program (both current and historical) to determine the need for initiating control activity. Identification and mapping are both essential to planning a control program which reduces pesticide discharge into surface waters of the State.

Analyze existing surveillance data to identify new or unidentified sources of mosquito or flying insect pest problems as well as sites that have recurring pest problems. As discussed above, mapping is a valuable tool in assessing pest habitats and designing control programs. Operators must analyze existing surveillance data to identity new sources of black fly problems.

In the event there are no data for your pest management area in the past calendar year, see Part 5 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in Part 2.2.1.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Part 2.2.1.2: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement, for pest management areas, efficient and effective means of pest management. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical or physical methods; Cultural methods; Biological control agents; and Pesticides. Operators are required to evaluate and implement a pest management strategy to limit pesticide discharge into surface waters of the State prior to the first pesticide application covered under this permit. Pest management strategies will vary by locality (i.e., stream size, stream substrate, and stream vegetation), black fly species (i.e., multi/univoltine development and host specificity), and financial concerns (i.e., accessibility to streams and size/rate of flow for the streams). As noted above, combinations of various

management methods are frequently an effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Operators must reevaluate every year prior to the first pesticide application for that calendar year.

Based on problem identification, two preventive strategies other than pesticides should be evaluated. The first is reducing the number of black fly breeding areas. This may include removal (physical and/or chemical) of vegetation and other objects in streams to reduce number of larval habitats. The second is temporary damming of flowing stream larval development sites to create pool habitats. As larvae require flowing water for development, pooling can kill developing black fly larvae. However, the impact of these habitat management options must be considered in relation to other environmental impacts on other aquatic species. Furthermore, due to the wide variability in stream size/flow rate and the accessibility of streams for habitat modification, these options are seldom acceptable control solutions for most black fly developmental habitats.

Pesticide Use

Conduct larval and/or adult surveillance prior to each pesticide application (unless its preventative application – see definition of Action Threshold in Appendix A) to assess the pest management area and to determine when action threshold(s) are met that necessitate the need for pest management. Larval surveillance involves routine sampling of aquatic habitats for developing black flies. Larval surveillance is primarily accomplished by collecting stream substrates (rocks, vegetation, etc.) and examining for larval and pupal occurrence. Due to the varied developmental sites for black larvae and their ability to move in streams relative to changes in flow patterns, quantitative sampling will vary from site to site and in many instances, particularly with continuously changing water levels, is not practical. Qualitative sampling is often used in lieu of quantitative sampling, as an indicator of egg hatch and to indicate the age distribution of developing larvae. Qualitative sampling alone when used in conjunction with historical occurrence data can provide a reliable indicator of the need to initiate control activities.

Adult surveillance for black flies may include sweep sampling, vacuum aspiration of adults, and the use of silhouette traps. Traps may be simple visual attractants or may be baited with artificial attractants (e.g., ocentol and CO_2). However, as different black fly species will respond differently in relation to different attractants, based on host preference, care must be used in selecting attractants that will provide a representative sample of the complete black fly spectrum present in any given location. Choice of adult sampling will in many cases be dictated by historical occurrence of black flies in a given area. Regardless, surveillance data is a useful tool in providing feedback to the mapping and planning component of any pest management strategy.

Assess environmental conditions (e.g., temperature, precipitation, and wind speed) in the treatment area prior to each pesticide application to identify whether existing environmental conditions support development of pest populations and are suitable for control activities. Environmental conditions may affect the results of pesticide application. Operators must assess the treatment area to determine whether site conditions support pest populations and are suitable for pesticide application.

Reduce the impact on the environment and on non-target organisms by applying the pesticide only when the action threshold has been met. Operators must apply pesticide only as indicated by action thresholds for the pest management area. As noted above, action threshold help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

In situations or locations where practicable and feasible for efficacious control, use larvicides as a preferred pesticide for mosquito or flying insect pest control when larval action thresholds have been met. Bacillus thuringiensis var israelensis (Bti) is the primary larvicide used for black fly control in the U.S. Bti is a gram positive, aerobic, spore-forming bacterium that produces protoxins in the form of parasporal protein crystals. In the alkaline digestive tract of black flies and mosquitoes, the protoxins become activated into highly toxic delta-endotoxins. The endotoxins cause a rapid breakdown in the lining of the mid-gut and necrosis of skeletal muscles, resulting in paralysis

and mortality of target insect pests. Bti is nontoxic to most non-target organisms due to their acidic digestive systems and lack of suitable tissue receptor sites.

To limit pesticide discharge into surface waters of the State, operators must apply larvicides as needed for source reduction as indicated by the action threshold in situations or locations where it is practicable and feasible to do so. The action threshold may be based on occurrence of adults (current or historical) and/or larval sampling of stream substrates for immature black flies. Surveillance is also a valuable tool for assessing the effectiveness of larval control activities.

Larvicides may be applied to streams using either ground or aerial equipment. Choice of equipment is largely dictated by stream size and accessibility. Application equipment may include backpack sprayers, boats equipped with sprayers or metered release systems, helicopters or fixed wing aircraft. The amount of insecticide required to treat a stream should be based on the desired dosage and the stream discharge. Stream discharge is calculated by determining the average width and depth of the stream and the stream velocity (discharge = width (m) x depth (m) x velocity (m/s)). Proper calibration of insecticide delivery based on discharge is necessary to ensure complete coverage throughout the water column in order to expose all larval habitats to an effective insecticide dose.

Larvicide is applied across the stream width for the time specified by the application rate. The point of application should be far enough upstream from the larval habitat to ensure proper insecticide dispersal in the water passing over the treatment area. Operators should determine the effective downstream carry (maximum distance at which at least 80% larval control is achieved) of the insecticide suspension. By determining downstream carry, black fly control operators can limit the number of applications necessary to treat any given stream and thereby reduce pesticide discharge into surface waters of the State.

In situations or locations where larvicide use is not practicable or feasible for efficacious control, use adulticides for mosquito or flying insect pest control when adult action thresholds have been met. Pesticide control of black flies in the U.S. historically relied upon both larvicides and adulticides. However, adulticide use against black fly populations is no longer a common practice. As adult black flies are seeking blood meals during the daytime, adulticide application coincides with human activity, so daytime application is no longer a standard control procedure. One reason for this change is due to environmental factors associated with daytime adulticide application, particularly thermal inversions, which cause adulticide application for black fly control to be ineffective. Furthermore, as only adults directly contacted by the adulticide application are killed, with no residual activity against other adults immigrating to the treatment area, adulticide applications are both ineffective and expensive. For these reasons, larvicides which target the immature stages before development of the pestiferous adult are now the primary means of black fly control in the U.S.

Recommended Black Fly Control References

EPA recommends the following sources for additional information on IPMs and BMPs for black fly control:

Commonwealth of Pennsylvania. 2009. Black Fly Suppression Program. Available at: http://www.depweb.state.pa.us/blackfly/cwp/view.asp?a=3&Q=505536&blackflyNav=|

Government of Alberta – Agriculture and Rural Development. 1993. Black Fly Control. Available at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3321

Greater Los Angeles Vector Control District. 2008. Black Flies – Vector Services and Information. Available at: http://www.glacvcd.org/Contents/Vector-Services-Info/Black-Flies.aspx

Metropolitan Mosquito Control District. 2009. Biting Gnat Control. Available at: http://www.mmcd.org/gnat.html

North Carolina Cooperative Extension. 2005. Insect Notes – Black Flies and Their Control. Available at: http://www.ces.ncsu.edu/depts/ent/notes/Urban/blackfly.htm

North Elba – Black Fly Control Dept. 2009. About the black fly control program. Available at: http://www.northelba.org/html/black_fly_control.html

Ohio State University Extension. 1997. Factsheet – Black Flies. HYG-2167-97. Available at: http://imayhavetermites.com/Black%20Flies,%20HYG-2167-97.htm

The Merck Veterinary Manual. 2009. Black Flies. Available at: http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/71702.htm

Undeen, AH and DP Malloy. 1996. Use of stream width for determining the dosage rates of Bacillus Thuringiensis Var. israensis for larval black fly (Diptera: Simuliidae) control. Journal of the American Mosquito Control Association. 12(2):312-315. Available at: http://www.nysm.nysed.gov/bio_molloy/patent_pubs/pdfs/undeen_&_molloy_1996_use_of_stream_width.pdf

University of Florida. 2007. Featured Creatures – Black Flies. EENY-30. Available at http://entomology.ifas.ufl.edu/creatures/livestock/bfly.htm

University of New Hampshire Cooperative Extension. 2001. Black Flies. Available at: http://www.ultimate.com/washington/wla/blackfly/

2.2.2 IPM for Pesticide Use Pattern # 2: Aquatic Weed and Algae Control

Background

Aquatic weeds and algae that negatively affect aquatic biodiversity, human health, and economic stability are considered to be pests. Aquatic weeds and algae can decrease populations of native aquatic species including threatened and endangered species. Aquatic weeds and algae can reduce aquatic biodiversity by preventing desirable species growth and unbalancing desirable aquatic species populations and development. Social, economic, and human health are all affected by a lower aesthetic appeal of a water bodies, an increased cost of agricultural irrigation water, and an increase in the risk of human diseases by providing ideal vector breeding grounds. In addition, the reduction in the utility of water can have social and economic impacts due to reduced hydroelectric operations, impeded opportunity for recreational activities (e.g., fishing, boating, and swimming), and disruption of water transport (e.g., agricultural irrigation) to name a few. As a result, if aquatic weeds and algae become established and impede the environmental stability and use goals for a body of water, control measures will be necessary. Pest control may be necessary before the pests become established.

The requirements in Part 2.2.2, apply to pesticide discharges associated with management of aquatic weed and algae in, but not limited to, lakes, ponds, rivers, and streams.

Most aquatic plants and algae are largely beneficial to water quality, especially when present in the appropriate densities. However, overabundant native algae and aquatic vegetation, as well as introduced, exotic species can decrease water quality and utility. Dense plant or algae growth can interfere with recreational activities (e.g., fishing, boating, and swimming), disrupt water transport, reduce aquatic biodiversity by preventing desirable plant growth and unbalancing fish populations, lower the aesthetic appeal of a water body, and increase the risk of human diseases by providing ideal vector breeding grounds.

Algae

Algae are non-vascular plant that do not have true roots, stems, leaves, or vascular tissue and have simple reproductive systems. Some macroscopic algae may resemble a plant in appearance. Algae may occur in the sea or freshwater. Algae are an important aquatic food source for many animals. However, excess algae growth such as algae blooms, frequently caused by unbalanced or elevated nutrients, can be damaging to aquatic ecosystems. Control options include mechanical, biological, and chemical methods.

Weeds

Aquatic weeds include floating, emergent, or submerged plants that negatively impact the quality and utility of surface waters of the State. Aquatic systems need plant materials as an important part of the systems ecology; however, when vegetation becomes established to the point of impeding the use goals for a body of water, control measures will become necessary. As a part of such aquatic weed control programs a pest management strategy should consider mechanical, biological, and/or chemical controls. Details for developing an integrated aquatic weed pest management strategy can be found in the document *Aquatic Plant Management, Best Management Practices in Support of Fish and Wildlife Habitat* (January 2005. Aquatic Ecosystem Restoration Foundation. Project Leader Kurt Getsinger, Ph.D. http://cenapa.ucdavis.edu/files/54815.pdf).

The appropriate type of control for aquatic weeds and algae is dictated by the biology of the target species and by environmental conditions and concerns for a specific area. "Control" means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of aquatic nuisance plants from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of aquatic nuisance plants and to prevent further invasions. [Source: www.invasivespeciesinfo.gov/laws/execorder.shtml#sec1] Numerous strategies are used to reduce the impact of aquatic weeds and algae, but a pest management strategy should be the basis for any pest control program. This is a comprehensive approach for managing pest populations using a variety of control methods.

Aquatic Weed and Algae Control IPM Practices

Identify the Problem

Part 2.2.2.1: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year you must do the following for "pest management areas", as defined in Appendix A. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year.

Identify areas with aquatic weed or algae problems and characterize the extent of the problems, including, for example, water use goals not attained (e.g., wildlife habitat, fisheries, vegetation, and recreation). Operators must be well-acquainted with the unique regional conditions of their sites and available methods for controlling the pest species present. Intended use goals for the water bodies that are being impeded because of nuisance pest infestation must also be considered based on the control site. The use of the best available mapping information to aid in identifying the problem areas is suggested. Mapping may include aerial photo assessments, topographic maps, and satellite imagery where available and/or practicable. Mapping can be essential to identify problem areas which can and cannot be controlled using non-pesticide preventative measures (e.g., mechanical control). Mapping can also be used in plotting the regional desired aquatic species, as well as water use goals and complaints or reports of aquatic weeds and algae from the public.

Identify target weed species. Positive identification of the aquatic weed or algae is required because many species within the same genera may require different levels and types of control measures species. Aquatic weed and algae identification is important when determining the best pest management strategy for each particular species and for determining application areas. Operators should develop a detailed pest management strategy based on identification of the targeted pest species which occur in their area.

Establish a protocol that draws on knowledge of past practices and effectiveness for implementing pest management strategies, factoring in any applicable aquatic weed or algae densities. Any data and/or information regarding pest densities can be used to establish an action threshold. Determining increases in pest densities may indicate a need for action. An action threshold must be established before implementing a pest management strategy. However, action thresholds are normally species specific.

In the event there are no data for your pest management area in the past calendar year, see Part 5 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in Part 2.2.2.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Part 2.2.2.2: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement, for pest management areas, efficient and effective means of pest management to control aquatic weeds or algae. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical or physical methods; Cultural methods; Biological control agents; and Pesticides.
Operators must evaluate and implement a pest management strategy to limit pesticide discharge into surface waters of the State prior to the first pesticide application covered under this permit. As noted above, combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Operators must reevaluate every year prior to the first pesticide application for that calendar year. All control measures must be implemented in a manner that limits impacts to non-target species. The following describes the management options that must be evaluated.

No Action

No action is to be taken, although an aquatic weed or algae problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified, no available controls exist, or the pest population is stable at a level that does not impair water body uses.

Prevention

Preventing introductions of possible aquatic weeds and algae is the most efficient way to reduce the threat of nuisance species (ANS Task Force, 2009). Identifying primary pathways of introduction and actions to cut off those pathways is essential to prevention. Through a better understanding of the transportation and introduction of aquatic weeds and algae, private entities (aquaculture) and the public have the necessary knowledge to assist in local aquatic weed and algae control by reducing conditions that encourage the spread of aquatic weeds and algae in their immediate surroundings. For example, recreational water users provide a pathway of unintentional introductions. Increasing public awareness of aquatic weeds and algae, their impacts, and what individuals can do to prevent their introduction and spread is critical for prevention. Other examples of prevention include: better design of water holding sites, better management and maintenance of potential problem sites, and volunteer removal of pest species (e.g., hand weeding). Monitoring and detection also play important roles in the prevention of the spread and introduction of aquatic weeds and algae.

Cultural Method

Cultural techniques include the use of pond dyes and water-level drawdown. Use pond dyes to manage filamentous algae and submersed (underwater) vegetation. Several pond colorants and one or two dyes are EPA-registered for aquatic-weed control. Pond dyes and colorants can be effective if there is little water outflow from the pond. Dyes and colorants intercept sunlight needed by algae and other underwater plants for photosynthesis. Therefore, they are generally ineffective on floating plants like duckweed and water lilies and emergent (growing above the surface) plants like cattails and bulrushes. Dyes and colorants are nontoxic and do not kill the plants, and they are safe for use in ponds for irrigation, fishing and livestock. However, they are not intended for use in large lakes with a lot of water flow or lakes used for public water supplies.[1]

Mechanical and Biological Control

Mechanical and biological controls will be the appropriate method in some cases, or a part of a combination of methods. In some instances, the need for chemical pesticide use in and adjacent to the affected habitat can be reduced or virtually eliminated with proper execution of alternative strategies and proper best management practices.

Mechanical control techniques will vary depending on the pest. Examples include dewatering, pressure washing, abrasive scrubbing, and weed removal by hand or machine.

Biological control of aquatic weeds and algae may be achieved through the introduction of diseases, predators, or parasites. While biological controls generally have limited application for control of aquatic weeds and algae, the operator should fully consider this option in evaluating pest management options.

Pesticides

Aquatic herbicides are chemicals specifically formulated for use in water to kill or control aquatic plants. Aquatic herbicides are spray directly onto floating or emergent aquatic plants or are applied to the water in either a liquid or pellet form. Systemic herbicides are capable of killing the entire plant. Contact herbicides cause the parts of the plant in contact with the herbicide to die back, leaving the roots alive and able to regrow. Non-selective, broad spectrum herbicides will generally affect all plants that they come in contact with. Selective herbicides will affect only some plants.[2]

Pesticide Use

Conduct surveillance prior to each pesticide application (unless its preventative application – see definition of Action Threshold in Appendix A) to assess the pest management area and to determine when the action threshold is met that necessitates the need for pest management. Often, each aquatic weed and algae species and pest management area warrants a different pest management strategy tailored to the regional conditions. The pest management strategy should consist of combinations of mechanical, biological, and/or pesticidal control methods. All control measures must be conducted in a manner that limits impacts to non-target species.

Operators should apply chemical pesticides only after considering the alternatives and determining those alternatives not to be appropriate control measures. If pesticides are used they must be used only as needed as determined by the action threshold, and proper best management practices including use of the an effective application rate (while avoiding over-application). Also, the operator should conduct surveillance (e.g., pest counts or area survey) prior to application of pesticides to determine when the action threshold is met and necessitates the need for pest control measures.

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[1] http://www.grounds-mag.com/mag/grounds_maintenance_weeds_overboard/
[2] http://www.ecy.wa.gov/programs/wq/plants/management/aqua028.html

Surveillance may include the relatively sophisticated transect method used in ecological studies to evaluate species distribution, or it may consist of simply conducting visual observations in the treated area to verify the eradication or reduction in populations of aquatic weeds and algae following pesticide application (Getsinger et al. 2005, pp 23-25).

Reduce the impact on the environment and non-target organisms by applying the pesticide only when the action threshold has been met. Operators must apply pesticide only as indicated by action thresholds for the pest management area. As noted above, action threshold help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

Environmental factors such as temperature and dissolved oxygen content, as well as biological factors such as stage of growth should be considered when deciding on application timing. Partial site treatments over time may be considered to reduce risk. Pesticide application must be limited to the appropriate amount required to control the target pests. Methods used in applying pesticides must limit the impact to non-target species.

Recommended Aquatic Weed and Algae Control References

EPA recommends the following sources for additional information on IPM's and BMP's for aquatic nuisance plant control:

Aquatic Nuisance Species Taskforce. Online: http://www.anstaskforce.gov/default.php.

Aquatic Plant Management, Best Management Practices in Support of Fish and Wildlife Habitat. January 2005. Aquatic Ecosystem Restoration Foundation. Project Leader Kurt Getsinger, (http://cenapa.ucdavis.edu/files/54815.pdf)

2.2.3 IPM for Pesticide Use Pattern # 3: Aquatic Nuisance Animal Control

Background

Aquatic nuisance animals, such as fish, lampreys, and mollusks, negatively affect aquatic biodiversity, human health, and economic stability. Aquatic nuisance animals decrease populations of native aquatic species including threatened and endangered species. Aquatic nuisance animals can reduce aquatic biodiversity by preventing desirable species growth and unbalancing desirable aquatic species populations and development. Social, economic, and human health are all affected by a lower aesthetic appeal of water bodies, an increased cost of agricultural irrigation water, and an increase in the risk of human diseases by providing ideal vector breeding grounds. In addition, the reduction in the utility of water can have social and economic impacts due to reduced hydroelectric operations, impeded opportunity for recreational activities (e.g., fishing, boating, and swimming), and disruption of water transport (e.g., agricultural irrigation), to name a few. As a result, if or when aquatic nuisance animals become established and impede the environmental stability and use goals for a body of water, control measures will become necessary.

The requirements in this Part apply to pesticide discharges associated with management of aquatic nuisance animals including, but not limited to, fish, lampreys, and mollusks. Aquatic nuisance animal control includes management of nuisance species in surface waters of the State including but not limited to lakes, ponds, rivers, estuaries, and streams. As a part of an aquatic nuisance animal control program, a pest management strategy should consider mechanical, biological, and chemical controls. Details for identifying aquatic nuisance animals and developing a pest management strategy can be found online through the Aquatic Nuisance Species Taskforce (http://www.anstaskforce.gov/default.php).

Fish

Reasons for applications of piscicides in surface waters of the State for controlling nuisance species of fish may include, but are not limited to, restoration of threatened and endangered species; fish population management; restoration of native species; and aquaculture. A pest management strategy for fish should consider mechanical, biological, and chemical controls.

Lampreys

There are approximately 40 species of lamprey, which are aquatic vertebrates. The sea lamprey is an example of a problematic non-native parasitic species that feeds on native fish species in U.S. waters. Lampreys may be managed using lampricides that are applied directly to the surface waters of the State. Several effective management techniques such as mechanical and biological methods are available for lamprey control in addition to lampricides and should be considered when developing a pest management strategy.

Mollusks

Nuisance mollusks including, but not limited to, zebra and quagga mussels, may cause damage to freshwater ecosystems, degrade drinking water, clog water-intake/discharge pipes for utilities and industries, and negatively impact commercial and recreational activities. Use of molluscicides is one of several methods of control for these aquatic nuisance animals; however, it is important to consider the impacts of mechanical, biological, and/or chemical pesticide use for control of mussels and other aquatic nuisance mollusk species.

Other Aquatic Nuisance Animals

There may be aquatic nuisance animals of concern in addition to fish, lampreys, and mollusks. Control of other aquatic animals including, but not limited to, crustaceans found to be a nuisance and requiring management with mechanical, biological, and/or chemical pesticides are included in the requirements in Part 2.2.3.

The appropriate type of control for aquatic nuisance animals is dictated by the biology of the target species and by environmental conditions and concerns for a specific area. "Control" means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of aquatic nuisance animals from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of aquatic nuisance animals and to prevent further invasions. [Source: www.invasivespeciesinfo.gov/laws/execorder.shtml#sec1] Numerous strategies are used to reduce the impact of aquatic nuisance animals, but a pest management strategy should be the basis for any pest control program. This is a comprehensive approach for managing pest populations using a variety of control methods.

Aquatic Nuisance Animal IPM Practices

Identify the Problem

Part 2.2.3.1: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must do the following for "pest management areas", as defined in Appendix A. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year

Identify areas with aquatic nuisance animal problems and characterize the extent of the problems, including, for example, water use goals not attained (e.g., wildlife habitat, fisheries, vegetation, and recreation). Operators must be well-acquainted with the unique regional conditions of their sites and available methods for controlling the pest species present. Intended use goals for the water bodies that are being impeded because of nuisance pest infestation must also be considered based on the control site.

The use of the best available mapping information to aid in identifying the problem areas is suggested. Mapping may include aerial photo assessments, topographic maps, and satellite imagery where available and/or practicable. Mapping can be essential to identify problem areas which can and cannot be controlled using non-pesticide preventative measures (e.g., mechanical control). Mapping can also be used in plotting the regional distribution of desired aquatic species, as well as water use goals and complaints or reports of aquatic nuisance animals from the public.

Identify target aquatic nuisance animal species. Positive identification of the aquatic nuisance animal is required because many species within the same genus may require different levels and types of control measures. Aquatic nuisance animal identification is important when determining the best pest management strategy for each particular species and for determining application areas. Operators must develop a detailed pest management strategy based on identification of the targeted pest species which occur in their area.

Identify possible factors causing or contributing to the problem (e.g., nutrients, invasive species). While there may not be reasonable means to control and/or stop the introduction and occurrence of some nuisance species infestations, the identification of possible sources (e.g., outflows from other water systems/bodies) may help in reducing the need for control measures. Potential factors which could lead to establishment of aquatic nuisance animal populations such as accidental or intentional introduction of exotic species must be identified before control measures are implemented.

Establish a protocol that draws on knowledge of past practices and effectiveness for implementing pest management strategies, factoring in any applicable aquatic nuisance animal densities. An action threshold should be established before implementing a pest management strategy. Any data and/or information regarding pest densities can serve as an action threshold.

In the event there are no data for your pest management area in the past calendar year, see Part 5 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in Part 2.2.3.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Part 2.2.3.2: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each year thereafter prior to the first pesticide application during that calendar year, you must select and implement, for pest management areas, efficient and effective means of pest management to control aquatic nuisance animals. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical or physical methods; Biological control agents; and Pesticides.
Operators are required to evaluate and implement a pest management strategy to limit pesticide discharge into surface waters of the State prior to the first pesticide application covered under this permit. As noted above, combinations of various management methods are frequently the most effective control strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Operators must reevaluate every year prior to the first pesticide application for that calendar year. All control measures must be conducted in a manner that limits impacts to non-target species. The following describes the management options that must be evaluated.

No Action

No action is to be taken, although an aquatic nuisance animal problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified or no available controls exist.

Prevention

Preventing introductions of possible nuisance species is the most efficient way to reduce the threat of aquatic nuisance animals (ANS Task Force, 2009). Identifying primary pathways of introduction and actions to cut off those pathways is essential to prevention. Through a better understanding of the transportation and introduction of aquatic nuisance animals, private entities (aquaculturists) and the public have the necessary knowledge to assist in local aquatic nuisance animal control by reducing conditions that encourage the spread of aquatic nuisance animals in their immediate surroundings. For example, recreational water users provide a pathway of unintentional introductions. Increasing public awareness of aquatic nuisance species, their impacts, and what individuals can do to prevent their introduction and spread is critical for prevention. Other examples of prevention include: better design of water holding sites, better management and maintenance of potential problem sites, and volunteer removal of pest species (e.g., fishing). Monitoring and detection also play important roles in the prevention of the spread and introduction of aquatic nuisance animals.

Mechanical and Biological Control

Mechanical and biological controls will be the appropriate methods in some cases, or a part of a combination of methods. Mechanical control techniques will vary depending on the pest. Examples include fishing, dewatering, netting, electro-fishing, pressure washing, use of electric fences and abrasive scrubbing.

Biological control of aquatic nuisance animals may be achieved through the introduction of diseases, predators, or parasites. While biological control generally has limited application for control of aquatic nuisance animals, operators should fully consider this option in evaluating pest management options.

Cultural Method

Cultural controls require altering the habitat such that it is unsuitable for the aquatic nuisance animals. This is an unlikely method of control for aquatic nuisance animal control.

Pesticides

Chemical and biological pesticides such as lampricides, molluscides, and piscicides, are registered for use to control aquatic nuisance animals. These pesticides are specifically formulated for use in water where aquatic nuisance animals occur. In some cases, pesticide use may impact non-target species. As described below, once the determination is made to use pesticides, additional requirements must be met.

Pesticide Use

Conduct surveillance prior to each application (unless its preventative application – see definition of Action Threshold in Appendix A) to assess the pest management area and to determine when the action threshold is met that necessitates the need for pest management. Often, each aquatic nuisance animal and pest management area warrants a different IPM plan, tailored to the regional conditions. The IPM practices should consist of combinations of mechanical, biological, and/or pesticidal control methods. All control measures must be conducted in a manner that limits impacts to non-target species.

Operators must apply chemical pesticides only after considering the alternatives and determining those alternatives not to be appropriate control measures. In some instances, the need for chemical pesticide use in and adjacent to the affected habitat can be reduced or virtually eliminated with proper execution of alternative strategies and proper best management practices. If pesticides are used, they must only be used as needed as determined by an action threshold, and proper best management practices must be adopted, including use of the an effective application rate (while avoiding over-application). Also, the operator must conduct surveillance (e.g., pest counts or area survey) prior to application of pesticides to determine when the action threshold is met that necessitates the need for pest control measures.

Surveillance may include the relatively sophisticated transect method used in ecological studies to evaluate species distribution, or it may consist of simply conducting visual observations in the treated area to verify the eradication or reduction in populations of aquatic nuisance animals following pesticide application (Getsinger et al. 2005, pp 23-25).

Reduce the impact on the environment and non-target organisms by applying the pesticide only when the action threshold has been met. Aquatic nuisance animal species and site restrictions (water use, water movement, etc.) must be identified when choosing an appropriate pesticide. Environmental factors such as temperature as well as biological factors such as migration timing should be considered when deciding on application timing. Partial site treatments over time may be considered to limit risk to non-target organisms.

Pesticide application must be limited to the appropriate amount required to control the target pests. Methods used in applying pesticides must limit the impact to non-target species.

Recommended Aquatic Nuisance Animal Control References

EPA recommends the following sources for additional information on IPMs and BMPs for ANS control:

Aquatic Nuisance Species Taskforce. Online: http://www.anstaskforce.gov/default.php.

Aquatic Plant Management, Best Management Practices in Support of Fish and Wildlife Habitat. January 2005. Aquatic Ecosystem Restoration Foundation. Project Leader Kurt Getsinger, (http://cenapa.ucdavis.edu/files/54815.pdf)

2.2.4 IPM for Pesticide Use Pattern # 4: Forest Pest Control

Background

Pests that threaten the health of the forest must be controlled to maintain forest health. Forest pest control programs are designed to integrate environment-friendly control measures (e.g., sterile insect release, pheromone trapping, mating disruption, etc.) to reduce losses and pesticide use. However, some pesticide applications may blanket large tracts of terrain to control an entire population of pests within a delimited geographic area

Forest pest control programs included in this permit are pesticide applications that may inadvertently expose surface waters of the State to direct, but limited, pesticide application. Forest pest control can be directed at a variety of pests, but primarily insects. Forest pest control programs are utilized to prevent habitat elimination/ modification, economic losses (e.g., habitat aesthetics, tree losses), quarantine pest outbreaks, and eradicate or prevent the spread of introduced invasive species. Therefore, forest pest management programs provide environmental, economic, and quality of life benefits in the U.S.

The type of forest pest control is dictated by the biology of the target pest and by environmental conditions and concerns for a specific area. Forest pest control programs are primarily conducted at the state and federal level but may also be conducted at the local/community level.

This permit requires IPM programs to incorporate, but not be limited to, the following components: problem identification, mapping/planning, pest survey, cultural control, biological control, chemical control, and education.

Forest Canopy Pest Control IPM Practices

Identify the Problem

Part 2.2.4.1: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application in that calendar year, you must do the following for "pest management areas", as defined in Appendix A. In order to reduce pesticide discharge into surface waters of the State associated with forest pest control, it is important for operators to ensure proper problem identification. Problem identification is determined through pest identification, delineation of the extent and range of the pest problem, determination of the potential for pest problem expansion, and assessing the economic impact of failure to provide pest control.

Establish target pest densities to serve as action threshold(s) for implementing pest management strategies. Operators must develop action thresholds for the target pests prior to first pesticide application covered under this permit. The action thresholds must be re-evaluated at least once each calendar year. As noted in the general discussion above, an action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable.

Identify target species to develop a species-specific pest management strategy based on developmental and behavioral considerations for each species. Pest identification is a key activity for implementation of a forest pest control system. Pest identification should only be conducted by personnel with adequate training and experience with the pests. While numerous similar pests (insects and/or pathogens) may be present in any given location, only a few of the representative species may constitute a threat which requires control activities. Through proper pest identification informed control decisions can be made based on the development biology of the pest (susceptible development stage), pest mobility (potential rate of spread), timing of selected control measures, applicable control techniques, and most effective chemical pesticides for the target species (insecticide class, resistance, etc.). Failure to identify pests can lead to unwarranted control activities and/or the need for chemical application with potential for discharge into surface waters of the State. Control for each specific pest is also predicated on the status of the pest as native recurring, quarantine restricted, or designated as an invasive species.

Identify current distribution of the target pest and assess potential distribution in the absence of control measures. Control activities are warranted only after exact pest identification and delineation of the extent of the pest infestation. As forest pest control can involve treating large expanses of forests, mapping is also an important component in identification of the problem. The distribution of the pest, usually insects, within the area of infestation can impact the selection of treatment activities. In addition, mapping of the pest infestation will allow evaluation of the actual/potential spread of the infestation (e.g., pest biology, pest mobility, and host availability) and also serve as a tool to evaluate the effectiveness of the control activities. Mapping can also provide essential information for assessment of economic damages that can result from the current and potential pest infestation and failure to control the pest. Management decisions can thereby be based on cost/benefit evaluations based on the current and potential distribution of any pest.

The third component of problem identification is to determine the potential economic impact of not controlling the pest. By establishing economic thresholds, it is possible to determine pest density action thresholds which warrant control activities. However, control decisions must take into account not only the projected economic impact of the current pest infestation but also the potential of the pest infestation to spread. Therefore, control decisions based on economic impact must in turn rely on proper pest identification, pest biology, and current and potential pest distribution.

In the event there are no data for your pest management area in the past calendar year, see Part 5 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in Part 2.2.4.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Part 2.2.4.2: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement for pest management areas efficient and effective means of pest management to control forestry pests. In developing these pest management strategies, you must evaluate the following management options considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical or physical methods; Cultural methods; Biological control agents; and Pesticides. Pest control activities in forest management programs may be warranted following problem identification and based solely on pest occurrence (e.g., quarantine pest, invasive species). However, in many instances control activities may only be necessary based on pest population distribution and/or pest densities. To reduce the need for pest control while also producing the best control results, a pest management strategy appropriate for the specific problem site(s) must be developed. A site-specific management plan will consider biotic (e.g., plant and animal species community structure) and abiotic (e.g., environmental) factors. Combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal of a pest management strategy in forest pest control should be to emphasize long-term control rather than a temporary fix.

All control measures must be conducted in a manner that limits impacts to non-target species. The following is a discussion of the relevant management options as they might be implemented for forest pest control.

No Action

No action is to be taken, although a forest pest control problem has been identified. This may be appropriate in cases where available control methods may cause secondary or non-target impacts or where aesthetic/ economic losses are not anticipated.

Mechanical and Biological Control

Mechanical and biological controls will be the appropriate method in some cases, or a part of a combination of methods. In some instances, the need for chemical pesticide use in and adjacent to the affected habitat can be reduced or virtually eliminated with proper execution of alternative strategies and proper best management practices.

Mechanical control techniques will vary depending on the pest. An example of mechanical control in a forest would be egg mass removal (gypsy moth).

Biological control of forest pests may be achieved through the introduction/enhancement of diseases, predators, or parasites. In addition, forest pest control programs aimed specifically at insects may also utilize sterile insect release, mating disruption, and biological pesticides. While biological controls generally have limited applications for forest pest control programs, they should be fully considered as an option in the development of an IPM plan. The latter two control approaches are often utilized when controlling for gypsy moth.

Cultural Methods

Cultural control methods are strategies that make the habitat unsuitable for a pest. An example of a cultural method to manage pests of the forest would be to select a different species of tree to plant, or to plant resistant varieties of trees. Maintaining the trees in good health to discourage pests is another method of cultural control.

Pesticides

Several chemical and biological pesticides are available that may be used to reduce defoliation of the trees. These pesticides are typically used when pest populations are high and the action threshold has been reached. These products are aerially applied. As described below, once the determination is made to use pesticides, additional requirements must be met.

Pesticide Use

Conduct surveillance prior to each application (unless its preventative application – see definition of Action Threshold in Appendix A) to assess the pest management area and to determine when a pest action threshold is met that necessitates the need for pest management. Operators must apply pesticides only as needed as determined by pre-established criteria and pest action thresholds. Operators must establish a pest action threshold that warrants pesticide application based on problem identification and pest surveillance. In order to establish pest densities and determine when pest action thresholds have been met, forest pest control programs must include pest surveillance activities as an integral component of pest management strategies. Pest surveillance is necessary to detect the presence (or confirm the absence) and magnitude of pest populations in a given location and precisely pinpoint zones of infestation. Surveillance activities will vary according to the pest (insect, weed, or pathogen) but in general should include observations of pest numbers, developmental stage of the current infestation, and biotic factors which would enhance development/expansion of pest populations (e.g., weather, crowding, predators, pathogens, etc.).

Pest surveillance will vary according to pest type and species. For insect pests, surveillance activities may include, but not be limited to, pheromone traps, sticky traps, light traps, defoliation monitoring. In some cases, traps used in surveillance activities have been developed to the extent that they alone provide adequate control of the targeted pest, thus eliminating the need for pesticide completely. Conversely, in the instance of quarantine pests or invasive species, pest identification alone may suffice to fulfill surveillance requirements and indicate need for control measures. Regardless, surveillance should take in to account local environmental conditions and projected environmental conditions which would support development and/or spread of the pest population and which would limit the choice or effectiveness of control activities.

It is also important to continue surveillance following control activities to assess treatment efficacy and to monitor for new pests. Surveillance can determine if the current techniques are effective and whether additional control measures are required, particularly pesticide application. Based on follow-up surveillance activity, operators can make informed decisions which serve to increase the effectiveness of their control programs and limit the potential for pesticide discharge to surface waters of the State. Surveillance is necessary not only to establish the species presence and their abundance but also as an evaluation tool of the effectiveness of chemical control activities. Furthermore, surveillance should be used as an indicator of the need for additional chemical control activities based on pre-established criteria related to population densities in local areas.

Assess environmental conditions (e.g., temperature, precipitation, and wind speed) in the treatment area to identify conditions that support target pest development and are conducive for treatment activities. Operator may use insecticides as dictated by the pest. Although pesticide formulations and applications vary according to pest and habitat, the focus here is on aerial applications of chemical/biological sprays. Aerial application is considered the preferred application method for large areas and areas that are inaccessible for ground application. In order to prevent poor site coverage, a guidance system (GPS), where economically feasible, or site flagging are necessary to increase accuracy of the treatment coverage while reducing the amount of pesticides being applied.

Before using a pesticide, the forest pest control operator should consider the following points; 1) do not apply a pesticide in unfavorable environmental conditions (e.g., windy, rainy, etc.) with increased potential for drift and wash off/runoff, 2) choose an application method and a pesticide formulation that will limit the potential for movement of the material to off-site locations, 3) restrict or limit the use of volatile pesticides on areas in or around sensitive on-target plants or animals, especially during hot weather, 4) generally, liquid pesticides applied by broadcast methods are

more subject to drift than are granular formulations and their application methods, 5) during liquid application, spray droplet size should be maintained within the recommended range for the proposed target and the application method to be used, and 6) use additives to limit drift and enhance efficacy as appropriate.

Reduce the impact on the environment and non-target organisms by applying the pesticide only when the action thresholds have been met. Forest pest species and site restrictions (water use, water movement, etc.) must be identified when choosing an appropriate pesticide. For instance with gypsy moth control a biological insecticide, Bacillus thuringiensis kurstaki, is usually selected. However, if endangered or threatened butterfly or moth species are in the area, a viral insecticide that specifically targets gypsy moth larvae will be selected. Environmental factors such as temperature, as well as biological factors such as migration timing should be considered when deciding on application timing. Partial site treatments over time may be considered to reduce risk to non-target organisms. Pesticide application must be limited to the appropriate amount required to control the target pests. Methods used in applying pesticides must limit the impact to non-target species.

Evaluate using pesticides against the most susceptible developmental stage. For forest pests, pesticides should be selected that target the most susceptible life stage. For instance, with gypsy moths, the larvae are present in the canopy, are soft-bodied, and therefore are the target of chemical controls.

Recommended Forest Pest Control Reference

EPA recommends the following source for additional information on IPM's and BMP's for forest pest control:

Emily Grafton and Ralph Webb. Homeowner's guide to gypsy moth management. West Virginia University Extension Service. http://www.nj.gov/agriculture/divisions/pi/pdf/GMguide.pdf

2.2.5 IPM for Pesticide Use Pattern # 5: Intrusive Vegetation Control

Background

Intrusive vegetation can create a public safety hazard and cause equipment and power line failures. Vegetation control may be needed around structures and equipment to allow inspections and to comply with local building, fire, and safety codes. Trees and vegetation can cause interruption of service by growing or falling into power lines. Contact between vegetation and power lines can lead to fires that can pose a danger to property owners and the environment. Trees and vegetation can impact underground utilities and create highway safety hazards.

Intrusive Vegetation Control IPM Practices

Identify the Problem

Part 2.2.5.1: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application in that calendar year, you must do the following for "pest management areas", as defined in Appendix A. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year.

Identify, as best possible, target pest (e.g., woody vegetation, aggressive vines) to develop a pest management strategy. Positive identification of the target pest is required because many species within the same genus may require different levels and types of control measures. Pest identification is important when determining the best pest

management strategy for each particular species and for determining application areas. Operators must develop a detailed pest management strategy based on the identification of the targeted pest species that occur in their area.

Identify, as best possible, current distribution of the target pest and assess potential distribution in the absence of control measures. Operators must be well-aquainted with the unique regional conditions of their sites and available methods for controlling the pest species present. The use of the best available mapping information to aid in identifying the problem areas is suggested. Mapping may include aerial photo assessments, topographics maps, and satellite imagery where available and/or practicable. Mapping can be essential to identify problem areas which can and cannot be controlled using non-pesticide preventative measures (e.g., mechanical control). Mapping can also be used in plotting regional distribution of desired vegetation species, as well as goals and complaints or reports of pest species from the public.

In the event there are no data for your pest management area in the past calendar year, see Part 5 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in 2.2.5.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Part 2.2.5.2: Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the State, and at least once each calendar year thereafter prior to the first pesticide application for the calendar year, you must select and implement, for pest management areas, efficient and effective means of pest management to intrusive vegetation. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical or physical methods; Biological control agents; Pesticides. Operators are required to evaluate and implement a pest management strategy to limit pesticide discharge into surface waters of the State, prior to the first pesticide application covered under this permit. Combinations of various management methods are frequently the most effective control strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Operators must re-evaluate every year prior to the first pesticide application for that calendar year. All control measures must be conducted in a manner that limits impacts to non-target species. The following describes the management options that must be evaluated.

No Action

No action is to be taken, although an instrusive vegetation problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified or no available controls exist.

Prevention

Prevention includes better or more frequent management and maintenance of potential problems sites. Monitoring and detection also play important roles in the prevention and spread of intrusive vegetation.

Mechanical and Biological Control

Mechanical and biological controls may be the appropriate methods in some cases, or part of a combination of methods. Mechanical controls include mowing, cutting, and digging up intrusive vegetation. Mowing or cutting woody vegetation; however, can cause the emergence of multiple sprouts thus causing the density of the intrusive vegetation to increase. Where practicality, safety, and wildlife habitat management allow, increasing the frequency of mowing or digging up the rootball of the vegetation may control the growth of intrusive vegetation.

While biological control generally may not be practical for many types of intrusive vegetation control, operators should fully consider this option in evaluating pest management options (e.g., encouraging the growth of low-growth plants (shrubs, herbs, grasses) in order to provide growing-space competition for tall-growth vegetation or the use of goats or other grazing animals in an enclosed area to manage vegetation).

Pesticides

Chemical pesticides are registered for use to control intrusive vegetation. Pesticides may be applied using ground-based applicators or aerially (in the case of rights-of-ways for electric power lines, for example). In some cases, pesticide use may impact non-target species. As described below, once the determination is made to use pesticides, additional requirements must be met.

Pesticide Use

Conduct surveillance prior to each application (unless its preventative application – see definition of Action Threshold in Appendix A) to assess the pest management area and to determine when the action threshold is met that necessitates the need for pest management. Often, each intrusive vegetation species and pest management area warrants a different pest management strategy tailored to the regional conditions. The pest management strategy should consist of combinations of mechanical, biological, and/or pesticidal control methods. All control measures must be conducted in a manner that limits impacts to non-target species.

Operators should apply chemical pesticides only after considering the alternatives and determining those alternatives not to be appropriate control measures. If pesticides are used, they must be used only as needed as determined by the action threshold, and proper best management practices including use an effective application rate (while avoiding over-application). Also, the operator should conduct surveillance (e.g., pest counts or area survey) prior to application of pesticides to determine when the action threshold is met that necessitates the need for pest control measures.

Assess environmental conditions (e.g., temperature, precipitation, and wind speed) in the treatment area to identify conditions that support target pest development and are conducive for treatment activities. Environmental conditions may affect the results of pesticide application. Operators must assess the treatment area to determine whether site conditions support pest populations and are suitable for pesticide application.

Reduce the impact on the environment and non-target organisms by applying the pesticide only when the action thresholds have been met. Operators must apply pesticide only as indicated by action thresholds for the pest management area. Action thresholds, established by the operator, help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

Recommended Instrusive Vegetation Control Reference(s)

American National Standards Institute (ANSI) A300 Standards for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices

3.0 WATER-QUALITY-BASED EFFLUENT LIMITATIONS

The CWA requires NPDES permits to include technology-based effluent limitations for all discharges and then if necessary for a specific discharge, water quality based effluent limitations (WQBELs). Permit writers are to assess whether the technology-based effluent limitations are protective of water quality standards and if not, permit writers must also include WQBELs as necessary to ensure that the discharge will not cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality (see Regulation 61-9.122.44(d)). In developing WQBELs; permit writers must consider the potential impact of

every proposed surface water discharge on the quality of the receiving water. Unlike individual permits that include requirements tailored to site-specific considerations, general permits, while tailored to specific industrial processes or types of discharges (e.g., from the application of pesticides), often do not contain site-specific WQBELs. Instead, general permits typically include a narrative statement that addresses WQBELs. In this permit the WQBEL is as follows:

> *Your discharge must be controlled as necessary to meet applicable water quality standards.*
> *If at any time you become aware, or the Department notifies you , that your discharge causes or contributes to an excursion of applicable water quality standards, you must take corrective action as required in Part 6.*

The first sentence includes the general requirement to control discharges as necessary to meet water quality standards, while the second sentence implements this requirement in more specific terms by imposing on operators a responsibility to take corrective action in response to an excursion of applicable water quality standards, whether discovered by the Department or by the permittee. Failure to take such corrective action is a violation of the permit. Additionally, the permit includes a provision, in Part 1.2.3, that specifies that the Department may determine that additional technology-based and/or water quality-based effluent limitations are necessary, or may deny coverage under this permit and require submission of an application for an individual NPDES permit, as detailed in Part 1.3.

Each permittee is required to control its discharge as necessary to meet applicable water quality standards. In general, the Department expects that compliance with the other conditions in this permit (e.g., the technology-based limitations, corrective actions, etc.) will result in discharges that are controlled as necessary to meet applicable water quality standards based on the cumulative effect of the following factors:

(1) Under FIFRA, EPA evaluates risk associated with pesticides and mitigates unreasonable ecological risk. Compliance with FIFRA is assumed. (See Part III.1.5 of this fact sheet.)
(2) EPA evaluated national–scale ambient monitoring data, as well as the frequency of the identification of specific pesticides as the cause of water impairments, to assess whether pesticide residues are currently present in waters at levels that would exceed water quality standards. The monitoring data show that, in most samples, most pesticides were below ambient water quality criteria or benchmarks developed by EPA's Office of Pesticide Programs (OPP) as indicators of narrative water quality criteria. For the small number of pesticides found in monitoring data to be present above such benchmarks, the evaluation, also documents risk mitigation actions taken by EPA (such as cancellation of pesticide uses) that EPA expects have reduced the levels of those pesticides in water.
(3) Technology-based effluent limitations in the PGP provide further protections beyond compliance with existing FIFRA requirements.
(4) Biological pesticides discharged to waters, by regulatory definition, do not work through a toxic mode of action. For chemical pesticides, the discharges covered under this permit are the residues after the pesticide has performed its intended purpose. Thus, the residue will be no higher than, and in many instances, lower than, the concentration of the pesticide as applied.
(5) The PGP excludes pesticide applications that result in discharges of any pesticide to: (1) waters impaired for that pesticide; or (2) any Tier 3 waters (i.e., outstanding national resource waters), unless approved by the Department.

For more detailed descriptions of the five factors identified above see EPA's 2010 NPDES Pesticides General Permit Fact Sheet.

This permit requires permittees to control discharges as necessary to meet applicable water quality standards. When the permittee or the Department determines a discharge will cause or contribute to an excursion above any WQS, including failure to protect and maintain existing designated uses of receiving waters, the permittee must take corrective action to ensure that the situation is eliminated and will not be repeated in the future. (See Part 6.0). If additional control measures are required, the Department expects the operator to vigilantly and in good-faith follow

and document, as applicable, the process for BMP selection, installation, implementation and maintenance, and cooperate to eliminate the identified problem within the timeframe stipulated in Part 6.0 of the PGP.

4.0 MONITORING

Monitoring is required in any NPDES permit specifically for the purpose of demonstrating compliance with the permit conditions. There are a variety of monitoring methods that a "traditional" NPDES permit may require, including end-of-pipe monitoring to show compliance with relevant effluent limitations prior to discharging to a receiving waterbody. Monitoring may also pertain to actions taken to ensure that record keeping or other permit control activities are being properly implemented. Water quality monitoring of receiving streams is not typically required in NPDES permits unless it is required to determine among other things, compliance with mixing zone dilution standards or some other special permit condition.

Pursuant to CWA section 308 and 402(a)(2), the PCA, and Regulation 61-9.122.43(a), and other applicable implementing regulations, the following requirements have been included in the permit, as discussed below. The monitoring requirements of this permit are narrative and demonstrate compliance with permit conditions by using currently established pesticide use routines for monitoring pest control. For instance, the permit requires routine visual inspections (described below) to be conducted as part of the pest treatment activity and as part of post-application pest surveillance, and calls for records of the pesticide discharge volume to be kept. The monitoring requirements of the permit are reasonable measures of good pest management practice that the conscientious operator should be currently employing to ensure environmental health and safety and optimal control of pest organisms.

Monitoring of pesticide discharges poses several challenges not generally encountered in "traditional" NPDES permitting situations. For example, there is no "wastewater discharge" per se from pesticide applications that is analogous to end-of-pipe discharges. A manufacturing plant would, for example, typically direct its wastewater through a treatment system to remove pollutants, and then would direct the effluent through a pipe into a receiving waterbody. However, for chemical pesticide applications, at the time of application the pesticide contains both the portion serving its intended purpose as well as the potential residual for which monitoring data would be appropriate. Thus, monitoring the "outfall" in this case would merely provide data on the amount of the product as applied (information already known through the FIFRA registration process) and would not be useful for comparing with any type of effluent limitation or water quality standard.

The Department considered requiring ambient water quality monitoring. However the Department determined that it was infeasible for the following reasons:

1) Uncertainty: Ambient water quality monitoring would generally not be able to distinguish whether the results were from the pesticide application for which monitoring is being performed, or some other upstream source.

2) Lack of applicable measurable standards: Pesticide-specific water quality standards do not exist at this time for the vast majority of constituents in the products authorized for use under this PGP.

3) Safety and Accessibility: Pesticides, particularly those used for mosquito control and forestry pest control, are often applied over waterbodies in remote areas, hazardous terrain, and swamps that are either inaccessible or pose safety risks for the collection of samples.

4) Difficulty of residue sampling for chemical pesticides: For chemical pesticides, the "pollutant" regulated by the PGP is the residue that remains after the pesticide has completed its activity, and it is this residue that would be the subject of any water quality monitoring requirement. However, the point at which only "residue" remains is not practically discernable at this time for all pesticides.

Given the questionable ability of ambient water quality data to demonstrate permit compliance, the Department has determined that there are suitable alternative monitoring activities to determine permit compliance, other than ambient water quality monitoring, for this permit.

Thus, the monitoring program that the Department has developed for this PGP has been tailored to accommodate the unique situations related to pesticide applications. Visual monitoring is required in the PGP to determine if any pesticide use practices may need to be revised to ensure that avoidable adverse impacts to the environment do not occur (See Section 4.2 of fact sheet). Monitoring records required by those operators who submit NOIs will establish a history that may indicate if or when practices need to be reconsidered.

4.1 Monitoring Requirements for Pesticide Applicators

All pesticide applicators must monitor the amount of pesticide used to ensure that the appropriate amount, consistent with applicable labeling, to effectively control the pest is balanced with the potential for development of pesticide resistance. The Department understands that appropriate application rates are variable depending on conditions, and expects pesticide applicators to use their best professional judgment in combination with the label requirements in determining the appropriate amount of product needed to optimize efficacy of the treatment. The Department expects that should a pest be eradicated or marginalized, no further discharge to control that pest should occur unless it is absolutely necessary for the continued control of that pest. All pesticide applicators must also monitor their operation to ensure the integrity of application equipment by calibrating, cleaning, and repairing equipment on a regular basis to reduce the potential for leaks, spills, and unintended/accidental release of pesticides to surface waters of the State.

4.2 Visual Monitoring Requirements for all Operators

Visual monitoring assessments are required as a means of identifying, for example, instances of detrimental impact to non-target organisms, disruption or degradation of wildlife habitat, or the prevention of designated recreational or municipal uses of a waterbody that may possibly be related to the operator's use of pesticides in a given area. Visual monitoring will consist of spot checks in the area to and around which pesticides are applied for possible and observable adverse incidents, such as fish kills and/or distressed fish or macro-invertebrates.

Visual monitoring assessments are required during the pesticide application when feasibility and safety allow. Visual monitoring is not required during the course of treatment when that treatment is performed in darkness as it would be infeasible for the inspector to note adverse effects under these circumstances. Additionally, the following scenarios often preclude visual monitoring during pesticide application:

1. Applications made from an aircraft.
2. Applications made from a moving road vehicle when the applicator is the driver.
3. Applications made from moving watercraft when the applicator is the driver.
4. Applications made from a moving off-road wheeled or tracked vehicle when the applicator is the driver.

A post-application visual monitoring assessment must also be conducted when considerations for safety and feasibility allow. If post-application surveillance is feasible, and it is safe to do so, post application surveillance must be performed.

If Part 4.2 monitoring is not performed, the operator is required to document his justification for not peforming Part 4.2 monitoring and keep this documentation in his records – see Part 7.1 of the permit.

5.0 PESTICIDE DISCHARGE MANAGEMENT PLAN

Part 5 of this permit requires certain operators who are subject to Part 2.2 of this permit to develop a Pesticide Discharge Management Plan (PDMP). Operators that are owners (except those solely performing "pesticide research

and development" as defined in Appendix A) who know or should have reasonably known prior to commencement of discharge, that they will exceed an annual treatment area threshold identified in Part 1.2.2 for that year, must develop a PDMP prior to January of the year following the effective date of the permit. Operators that are owners (except those solely performing "pesticide research and development" as defined in Appendix A) who do not know or would reasonably not know until after commencement of discharge, that they will exceed an annual treatment area threshold identified in Part 1.2.2 for that year, must develop a PDMP prior to exceeding the annual treatment area threshold. Operators that are owners commencing discharge in response to a "declared pest emergency situation" as defined in Appendix A, that will cause the operator to exceed an annual treatment area threshold, must develop a PDMP no later than 90 days after responding to the declared pest emergency. Additionally, operators that are owners requesting coverage under Part 1.1.1.f of the permit (i.e., those requesting coverage because their activities are similar to the defined use patterns covered under this permit) may be required to develop a PDMP. If so, they will be notified by the Department following the Department's review of the NOI. The PDMP must cover those pesticide use patterns that exceed or are expected to exceed a threshold in Table 1 of the permit. For-hire applicators are not required to develop a PDMP as development of the PDMP is already being required of the owner as described above. Once the operator meets the requirement to prepare a PDMP, he/she must maintain the plan thereafter for the duration of coverage under this general permit. This means even if the operator's annual treatment area subsequently falls below the annual treatment area threshold, the operator is required to keep the plan up-to-date.

Developing a PDMP helps operators ensure they have (1) taken steps to identify the pest problem, (2) evaluated pest management options, and (3) appropriate control measures to control pesticide discharges. Operators that are owners and exceed an annual treatment area due to a declared pest emergency and thus must submit an NOI, do not need to include activities in their PDMP that were conducted in response to that declared pest emergency. Their PDMP, however, must address any future pesticide application covered under this permit. Part 5.1 of the permit contains the required elements to be documented in the PDMP.

The PDMP itself does not contain effluent limitations; rather it constitutes a tool both to assist the operator in documenting what control measures it is implementing to meet the effluent limitations, and to assist the permitting/compliance authority in determining whether the effluent limitations are being met. A PDMP is a "living" document that requires periodic reviews and must be kept up-to-date. Where control measures are modified or replaced to meet effluent limitations, such as in response to a Part 6.1 triggering condition, such changes must be documented in the PDMP. If operators fail to develop and maintain an up-to-date PDMP, they will have violated the permit. This recordkeeping violation is separate and distinct from a violation of any of the other substantive requirements in the permit (e.g., effluent limitations, corrective action, monitoring, and reporting).

Operators may choose to reference other documents, such as a pre-existing integrated pest management (IPM) plan or spill prevention and response plan, in the PDMP rather than recreating the same text in the PDMP. It is not required that an operator must have authored the pre-existing plan in order to use it. When referencing other documents, the operator is responsible for ensuring his/her PDMP and the other documents together contain all the necessary elements for a complete PDMP, as specified in Part 5.1. In addition, the operator must ensure that a copy of relevant portions of those referenced documents is attached to the PDMP and is located on-site and it is available for review consistent with Part 5.3 of the permit.

5.1. Contents of Your PDMP

The PDMP prepared under this permit must meet specific requirements under Part 5.1 of the permit. Generally, operators must document the following: (1) people involved with the program; (2) a description of the pest management area and the pest problem; (3) a description of control measures; (4) schedules and procedures for application rate and frequency, pest surveillance, assessment of environmental conditions, spill prevention and response, equipment maintenance, adverse incident response, and pesticide monitoring; and (5) any eligibility considerations under other federal laws.

People Involved with the Program

The permit requires that a qualified individual or team of individuals be identified to manage pesticide discharge, including the pesticide applicator. If the pesticide applicator has not been identified at the time of the plan development, the operator should indicate whether or not a for-hire applicator will be used. Identification of personnel ensures that appropriate persons (or positions) are identified as necessary for developing and implementing the plan. Inclusion of personnel in the plan provides notice to staff and management (i.e., those responsible for signing and certifying the plan) of the responsibilities of certain key staff for following through on compliance with the permit's conditions and limits.

PDMP personnel are responsible for developing and revising the PDMP, implementing and maintaining the control measures to meet effluent limitations, and taking corrective action where necessary. Personnel should be chosen for their expertise in the relevant areas to ensure that all aspects of pest management are considered in developing the plan. The PDMP must clearly describe the responsibilities of each team member to ensure that each aspect of the PDMP is addressed. The Department expects most operators will have more than one individual on the team, except for small entities with relatively simple plans and/or staff limitations. The permit requires that PDMP personnel have ready access to any applicable portions of the PDMP and the permit.

Pest Management Area Description

The pest management area description includes the pest problem description, action threshold(s), a general location map, and water quality standards.

1. Pest Problem Description.

The permit requires that the PDMP include a description of the pest problem at the pest management area. A detailed pest management area description assists operators in subsequent efforts to identify and set priorities for the evaluation and selection of control measures taken to meet effluent limitations set forth in Parts 2 and 3 and in identifying necessary changes in pest management. The description must include identification of the target pest(s), source of the pest problem, and source of data used to identify the problem. The permit allows use of historic data or other available data (e.g., from another similar site) to identify the problem at your site. If you use other site data, you must document in this section why data from your site is not available or not taken within the past year and explain why the data is relevant to your site. Additionally, the pest management area descriptions should include any sensitive resources in the area, such as unique habitat areas, rare or listed species, or other species of concern that may limit pest management options.

2. Action Threshold(s)

The permit requires that the PDMP include a description of the action threshold(s) established for the target pest, including a description of how they were determined. An action threshold is a level of pest prevalence at which an operator takes action to reduce the pest population.

3. General Location Map

The PDMP must also contain a general location map of the site that identifies the geographic boundaries of the area to which the plan applies and location of the surface waters of the State. To improve readability of the map, some detailed information may be kept as an attachment to the site map and pictures may be included as deemed appropriate.

4. Water Quality Standards

Operators must identify the water quality standards applicable to their discharge. This must include a list of pesticide(s) or any degradates for which the water is impaired. State water quality standards can be found at

http://www.scdhec.gov/environment/water/regs/r61-68.pdf and a list of impaired waters can be found at http://www.scdhec.gov/environment/water/tmdl.

Control Measure Description

The permit requires that the PDMP include a description of the control measures to demonstrate how the operators plan to meet the applicable technology-based or water quality-based effluent limitations. The description of the control measures selected to meet the effluent limitations must include a brief explanation of the control measures used at the site to reduce pesticide discharge, including evaluation and implementation of the six pest management tools (no action, prevention, mechanical/physical methods, cultural methods, biological control agents, and pesticides). Operators must consider impact to non-target organisms, impact to water quality, pest resistance, feasibility, and cost effectiveness when evaluating and selecting an efficient and effective means of pest management to limit pesticide discharge to surface waters of the State.

All six pest management tools may not be available for a specific use category and/or treatment area. However, the PDMP must include documentation of how the six pest management tools were evaluated prior to selecting a site-specific pest management strategy. For the no action option, operators should document the impact of this option without any current pest management strategy at the site. For the prevention management option, the operator should document the methods implemented to prevent new introductions or the spread of the pests to new sites such as identifying routes of invasion and how these can be intercepted to reduce the chance of invasion. Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods, like wash stations, to prevent reintroduction by vehicles, personnel, etc. Some prevention management methods may fall under mechanical/physical or cultural methods as well.

For the pesticide management option, operators must include a list of active ingredient(s) evaluated. Discussion should also identify specific equipment or methods that will prevent or reduce the risks to non-target organisms and pesticide discharges to surface waters of the State.

Schedules and Procedures

a. The following schedules and procedures, used to comply with the effluent limitations in Part 2 of the permit, must be documented in the PDMP:

1. Application Rate and Frequency Procedures

In the PDMP, operators must describe the procedures for determining the effective amount of pesticide product per application and the optimum frequency of pesticide applications (while avoiding over-application) to limit discharges from the application of pesticide.

2. Spill Prevention

a. Operators must describe the spill prevention program for their pest management area. The program should address areas and activities at the site that typically pose a high risk for spills including loading and unloading areas, storage areas, process areas, and waste disposal activities. It should also address appropriate material handling procedures, storage requirements, and containment or diversion equipment that will limit the potential for spills, or in the event of a spill, enable proper and timely response.

b. As required in Part 6.1 of this permit, any spills or leaks that occur while covered under this permit must be documented.

c. Documenting spills does not relieve operators of any reporting requirements established in 40 CFR 110, 40 CFR 117, and 40 CFR 302, or any other statutory requirements relating to spills or other releases of oils or hazardous substances.

3. Pesticide Application Equipment Procedures

Operators must describe the preventive equipment maintenance program to keep the pesticide application equipment in proper operating condition, including how and when the following will be addressed: calibration, regular inspections, and cleaning/repairing of the application equipment to avoid situations that may result in leaks, spills, and other releases.

4. Pest Surveillance Procedures

Operators must discuss how their pest surveillance programs assess the pest treatment area, to determine when the action threshold(s) is met. The discussion should also include surveillance method(s) selected.

5. Environmental Conditions Assessment Procedures

Operators must discuss the procedures and methods to assess environmental conditions in the treatment area.

b. The following additional schedules and procedures necessary to limit discharges must also be documented in the PDMP.

1. Spill Response Procedures

The PDMP must document procedures for expeditiously stopping, containing, and cleaning up leaks, spills, and other release. In addition, the PDMP must include documentation of the procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies.

2. Adverse Incident Response Procedures

In the PDMP, operators must document appropriate procedures for responding to an adverse incident resulting from pesticide applications. Operator must identify and document the following:

- Course of action or responses to any incident resulting from pesticide applications;
- Chain of command notification for the incident, both internal to your agency/organization and external;
- State/Federal contacts with phone numbers;
- Name, location, and telephone of nearest emergency medical facility;
- Name, location, and telephone of nearest hazardous chemical responder; and (including police and fire department).

3. Pesticide Monitoring Schedules and Procedures

In the PDMP, operators must describe procedures for monitoring consistent with the requirements in Part 4.0 including:

- The process for determining the location and timing of monitoring;
- A schedule and procedures for monitoring;
- The person (or position) responsible for conducting monitoring; and
- Procedures for documenting any observed impacts to non-target organisms resulting from your pesticide discharge.

Signature Requirements

The PDMP must be signed and certified in accordance with the signatory requirements in the Standard Permit Conditions part of the permit (Appendix B, Subsection K). This requirement is consistent with standard NPDES permit conditions described in Regulation 61-9.122.22 and is intended to ensure that the operator understands his/her responsibility to create and maintain a complete and accurate PDMP. The signature requirement includes an acknowledgment that there are significant penalties for submitting false information.

5.2 Pesticide Discharge Management Plan Modifications

This permit requires that the PDMP be updated whenever any of the triggering conditions for corrective action in Part 6.1 of the permit occur, or when a review following the triggering conditions in Part 6.1 requires the operator to revise his/her control measures as necessary to meet the effluent limitations in this permit (Part 2). Keeping the PDMP up-to-date will help the operator ensure that the condition that triggered the corrective action does not reoccur. Operators are also required to review the PDMP whenever necessary to update the pest problem description and pest management strategies at the pest management area.

It is important to note that failure to update the PDMP in accordance with Part 5.2 is a recordkeeping violation, not a violation of an effluent limit. For example, if the operator changes its maintenance procedures, but fails to update its PDMP to reflect these changes, a recordkeeping violation will result. The operator must revise its PDMP to reflect the new maintenance procedures and include documentation of the corrective action (in accordance with Part 6) to return to full compliance.

5.3 Pesticide Discharge Management Plan Availability

This permit requires that a copy of the current PDMP, along with all supporting maps and documents, be kept at the operator physical address provided on the NOI. The PDMP and all supporting documents must be immediately available to representatives of EPA and/or the Department at the time of an on-site inspection or upon request. This requirement is consistent with standard NPDES permit conditions described in Regulation 61-9.122.41. Part 5.3 of this permit indicates that the Department may provide access to portions of your PDMP to a member of the public upon request. Confidential Business Information (CBI) may be withheld from the public, but consistent with State law, may not be withheld from EPA or the Department.

6.0 CORRECTIVE ACTION

The purpose of including corrective action requirements in this permit is to assist this new universe of NPDES permittees with effectively meeting technology-based and water-quality-based effluent limitations and implementing integrated pest management practices in this permit. This part of the permit applies to owners and for-hire applicators. Corrective actions in this permit are follow-up actions a permittee must take to assess and correct problems. They require review and revision of control measures and pesticide application activities, as necessary, to ensure that these problems are eliminated and will not be repeated in the future. The permit makes clear that the permittee is expected to assess why a specific problem has occurred and document what steps were taken to eliminate the problem. The Department believes this approach will help permittees in complying with the requirements of the permit quickly. Compliance with many of the permit's requirements -- for instance, those related to reporting and recordkeeping and some of those related to operation and maintenance -- can be accomplished immediately, and therefore, are not considered problems that trigger corrective actions.

It should be noted that a situation triggering corrective action is not necessarily a permit violation and, as such, may not necessarily trigger a modification of control measures to meet effluent limitations. However, failure to conduct (and document) corrective action reviews in such cases does constitute a permit violation.

6.1 Situations Requiring Revision of Control Measures

Permittees are required to review and, as necessary, revise the selection and implementation of their control measures to eliminate any of the following situations:

- an unauthorized release or discharge occurs;
- the permittee becomes aware, or the Department determines, that control measures are not stringent enough for the discharge to meet applicable water quality standards;
- any monitoring activities indicate that the permittee failed to use effective amounts of pesticides and optimize frequency of applications, perform regular maintenance to reduce leaks, spills, etc., or maintain equipment in proper operating condition;
- an inspection or evaluation of your facility by an EPA or Department official determines that modifications are necessary to meet the non-numeric effluent limits detailed in Part 2 of the PGP; or
- the permittee observes or is otherwise made aware (e.g., a third party notification) of an adverse incident for which symptoms are unusual or unexpected during the normal course of treatment.

The Department considers the above situations to be of significant concern. Thus, the Department is requiring permittees to assess the cause of these situations which may be affiliated with the permittees discharge from the application of pesticides and to take any necessary steps to eliminate the situation and ensure that the situation will not be repeated in the future.

The purpose of Part 6.1 is to ensure compliance with corrective action requirements through increased accountability and oversight. The Department views ongoing assessment of control measure effectiveness and corrective actions as integral to an effective pesticide management program. This corrective action assessment must be kept with the other recordkeeping documentation required by this permit.

6.2 Corrective Action Deadlines

The permit requires that corrective action be completed "before the next pesticide application that results in a discharge, if practicable, or if not, as soon as practicable thereafter." The Department emphasizes that this timeframe is not a grace period within which an operator is relieved of any liability for a permit violation. The Department is adopting this flexible deadline to account for the variation in types of responses (e.g., evaluate situation and select, design, install, and implement new or modified control measures) that may be necessary to address any identified situations of concern. The Department recognizes that in rare cases a corrective action review may identify the need for substantial improvements to the permittee's control measures, and does not want to limit the selection and implementation of such controls with an inflexible deadline. Another possibility is that the Department or the permittee may determine that further monitoring is needed under Part 6.3 of the permit to pinpoint the source of the problem, and this monitoring may need to be conducted during future pesticide application activities. However, the Department believes that in the vast majority of cases, corrective action reviews will identify responses that can be taken quickly, either before the next pesticide application that results in a discharge or shortly thereafter. The Department expects operators to document and justify any schedules for selecting, designing, installing, and implementing new or modified control measures.

When any of the listed situations are identified under Part 6.1, such as discovery that water quality standards are being exceeded, the permittee must take steps to ensure the problems causing any violation are eliminated. If the original inadequacy constitutes a permit violation, then that violation is not excused by response within the timeframe the Department has allotted for corrective action, though the Department may consider this when determining the appropriate enforcement response to a violation. The Department assumes that permittees will need less time to make minor repairs or change practices than to make substantial operational changes or equipment repair. A timeframe, albeit flexible, is included specifically so that problems are not allowed to persist indefinitely. Failure to take the necessary corrective action within the stipulated timeframe constitutes an additional and independent permit violation.

6.3 Effect of Corrective Action

The occurrence of a situation described in Part 6.1 may, but does not implicitly, constitute a violation of the permit. The occurrence of a situation identified in Part 6.1 does require the permittee to immediately review and as necessary, revise the selection and implementation of their control measures to eliminate the situation. Part 6.3 explains that taking corrective action does not absolve the permittee of any liability for a permit violation requiring that action, however, failure to take required corrective action will constitute an original or an additional permit violation. The Department will consider the appropriateness and promptness of corrective action in determining enforcement responses to permit violations. The Department or a court may impose additional requirements and schedules of compliance, including requirements to submit additional information concerning the condition(s) triggering corrective action, additional site-specific water-quality based limitations, additional monitoring requirements, or other schedules and requirements more stringent than specified in this permit. Those requirements and schedules will supersede those of Part 6.1 if such requirements conflict.

6.4 Adverse Incident Documentation and Reporting

Part 6.4 of the PGP requires permittees to take specific actions in response to identified adverse incidents which may have resulted from a discharge from the permittee's pesticide application. Namely, permittees are required to provide oral notice to the Department within 24 hours and then follow-up with a written report within 5 days of becoming aware of the adverse incident. The Department defines an "adverse incident" in Appendix A of the PGP, but generally it is defined as any effect of a pesticide's use that is unexpected or unintended.

Part 6.4.1 requires permittees to call the appropriate Department Regional office within 24 hours of any identified adverse incident and provide basic information about it. This notification can be made by either the owner or the for-hire applicator. The purpose of this requirement is twofold: (1) to provide an opportunity for the Department to respond to these incidents as soon as reasonably can be expected, and (2) to provide a basis for potential corrective actions. The Department does not expect this initial notification to be detailed but merely a reporting of the date of the finding, a general discussion of the incident and a review of the necessity to conduct corrective action. The permit requires permittees to document the information identified in 6.4.1, including the date and time you notified the Department and a description of any deviations from 6.4.1 notification requirements based on nuances of the adverse incident. For example, a permittee may decide to notify multiple Department contacts because of the severity of the adverse incident. This type of information should be included in the written documentation of the 24-hour notification as described below.

Part 6.4.2 requires permittees to provide a written report of the adverse incident to the appropriate Department Regional office within 5 days of discovering the adverse incident. This report may be submitted by either the owner or the for-hire applicator. The adverse incident report must include the following information:

- Information required to be provided in Part 6.4.1;
- Date and time you contacted the Department notifying the Department of the adverse incident and who you spoke with at the Department and any instructions you received from the Department;
- Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc.);
- A description of the circumstances of the incident including species affected, estimated number of individual and approximate size of dead or distressed organisms;
- Magnitude and scope of the affected area (e.g., aquatic square area or total stream distance affected);
- Pesticide application rate, intended use site (e.g., banks, above, or direct to water), method of application; and name of pesticide product, description of pesticide ingredients, and EPA registration number;
- Description of the habitat and the circumstances under which the adverse incident occurred (including any available ambient water data for pesticides applied);
- If laboratory tests were performed, indicate what test(s) were performed, and when, and provide a summary of the test results within 5 days after they become available;

- If applicable, explain why you believe the adverse incident could not have been caused by exposure to the pesticide;
- Actions to be taken to prevent recurrence of adverse incidents; and
- Signed and dated in accordance with Appendix B, Subsection K.

The Department believes adverse incident information associated with discharges from the application of pesticides is useful to the Department because the information:

- Provides the Department with an indication of the effectiveness of the permit in controlling discharges to protect water quality, including data upon which the Department may base future permit decisions (e.g., modifications to or reissuance of this permit);
- May be considered when reviewing applications for registration of new pesticides that are chemically similar to existing pesticides;
- May be considered in ecological risk assessment and during deliberations on risk management decisions;
- May be reviewed to determine trends that may indicate potential ecological impacts with an existing pesticide and/or to track improvements when mitigation measures are applied;
- Provides information on the nature, extent, and severity of incidents to decision-makers, stakeholders, and the public; and
- Provides the Department with information on which to assess compliance with regulatory requirements, including documentation and reporting.

Currently, there is no database that includes adverse reporting from anyone other than the registrant under 6(a)(2) of FIFRA. The Department does not consider inclusion of adverse incident reporting in the NPDES permit to be a duplicative requirement to the FIFRA section 6(a)(2) requirements for registrant reporting of adverse incidents. This is because pesticide registrants are not likely to be directly covered under the PGP. Requiring the reporting of adverse incidents and follow-up corrective actions may address the lack of a universal, mandatory legal duty for pesticide users to report adverse incidents, at least for the pesticide use patterns covered by this permit.

The Department acknowledges that assessing and correcting adverse incidents may be complicated in certain instances. For example, symptoms associated with adverse incidents are often vague or mimic other causes which may lead to incorrect diagnoses. Thus, it may be difficult to identify and track chronic effects resulting from pesticides discharges. It may also be difficult to observe adverse effects because of limited visibility or access such as dead fish poisoned in a wetland under dense vegetation or in sparsely populated areas or because scavengers scatter or devour carcasses before discovery. However, the Department believes that it is important to identify to the extent feasible situations where adverse effects occur where discharges from the application of pesticides also occur.

Immediately observable signs of distress or damage to non-target plants, animals and other macro-organisms within the treatment area may warrant concern for a possible adverse incident related to a discharge of pesticides during application. The Department acknowledges that some degree of detrimental impact to non-target species is to be expected and is acceptable during the course of normal pesticide treatment. The Department expects operators to use their best professional judgment in determining the extent to which non-target effects appear to be abnormal or indicative of an unforeseen problem associated with an application of pesticides.

During a visual inspection, operators should watch for distressed or dead juvenile and small fishes, washed up or floating fish, fish swimming abnormally or erratically, fish lying lethargically at the water surface or in shallow water, fish that are listless or non-responsive to disturbance, the stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants, and other dead or visibly distressed non-target organisms including amphibians, turtles, and macro-invertebrates. These observations must be noted unless they are deemed not to be aberrant (for example, distressed non-target fish are to be expected when conducting a treatment with rotenone and non-target vegetation will be stressed near the target of contact herbicides). It should be noted that observation of these impacts does not necessarily imply that a pesticide has been misused or that there has been a permit violation or an instance of

noncompliance, but may provide cause for further investigation of local water quality or reconsideration of Best Management Practices. Not reporting such incidents, however, is a permit violation.

Complete information concerning adverse impacts will aid the Department in any review of current or future pesticide use, adherence to Best Management Practices, or effectiveness of Best Management Practices. Reporting of adverse incidents is not required under this permit in the following situations: (1) you are aware of facts that clearly establish that the adverse incident was not related to toxic effects or exposure from the pesticide application; (2) you have been notified in writing by the Department that the reporting requirement has been waived for this incident or category of incidents; (3) you receive information notifying you of an adverse incident but that information is clearly erroneous; (4) an adverse incident occurs to pests that are similar in kind to pests identified as potential targets on the FIFRA label. However, records of all visual inspections, even for these situations, must be kept on site with the permittee.

Part 6.4.3 requires that permittees, if they become aware of an adverse incident to a federally-listed threatened or endangered species or its federally-designated critical habitat, that may have resulted from a discharge from you pesticide application, notify the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (FWS), as appropriate. This notification may be made by either the owner or the for-hire applicator. In the case of an adverse incident to an anadramous or marine species, you must immediately notify the NMFS at (727) 824-5301. In the case of an adverse incident to a terrestrial or freshwater species, you must notify the FWS at (843) 727-4707. In both cases, notification must be made by telephone immediately upon you becoming aware of the adverse incident and must include at least the following information:

- The caller's name and telephone number;
- Operator name and mailing address;
- The name of the affected species;
- How and when you became aware of the adverse incident;
- Description of the location of the adverse incident;
- Description of the adverse incident, including the EPA pesticide registration number for each product you applied in the area of the adverse incident; and
- Description of any steps you have taken or will take to alleviate the adverse impact to the species.

Additional information on federally-listed threatened or endangered species and federally-designated critical habitat is available from the NMFS at http://www.nmfs.noaa.gov for anadromous or marine species or FWS at http://www.fws.gov for terrestrial or freshwater species.

6.5 Reportable Spills and Leaks

Part 6.5.1 requires permittees to call the SCDHEC Emergency Response at (888) 481-0125 (24-hour/toll free) or (803) 253-6488 (in Columbia) and the National Response Center at (800) 424-8802 to report any spill or leak of a hazardous substance or oil equal to or in excess of a reportable quantity into surface waters of the State within 24 hours of becoming aware of the spill or leak.[3] This notification may be made by either the owner or the for-hire applicator. This notification must be made by telephone and must include:

- Chemical name or common name of compound released;
- Whether the substance is an Extremely Hazardous Substance (EHS);
- Estimate of quantity released;
- Time and duration of release;
- Location of release;
- Medium or media affected by the release (i.e., soil, water, or air);

[3] Reportable Spills and Leaks are defined as those that trigger the requirement to notify the National Response Center (40 CFR Parts 110, 117, 302) based on the type of pollutant and quantity released.

- Any known or anticipated acute/chronic health risks associated with the release, and any need for medical attention of exposed individuals;
- Need for precautions such as evacuation; and
- Name and telephone number of contact person.

Additionally, as soon as practicable, but no later than 14 calendar days of knowledge of the release, you must submit to the appropriate Department Regional office, a written description of the release including the updated information from the initial notice, the date the release occurred, the circumstances leading to the release, actual response actions, and steps taken in accordance with Part 6.5.2.c of the permit to prevent recurrence of the release. This report may be submitted by either the owner or the for-hire applicator.

The permittee should also be aware of any other state and local requirements that may necessitate reporting spills to local emergency response, public health, or drinking water supply agencies.

Part 6.5.2 requires permittees to document this notification within 5 days of becoming aware of such spill or leak. This documentation should include the information required to provided in Part 6.5.1 of the permit, a summary of corrective action taken or to be taken including date initiated and dated completed or expected completion date, and any measures to prevent recurrence of such a spill, leak, or other discharge including notice of whether PDMP modifications are required. A description of the reporting system that will be used to alert responsible managers and legal authorities in the event of a spill or leak should already be included in the Spill Response Procedures of your PDMP.

6.6 Other Corrective Action Documentation

For any event described in Part 6.1 of the permit, other than for adverse incidents or reportable spills or leaks, immediate reporting to the Department is not required, but permittees must document basic information describing the event and the permittees' response to that event within 5 days. For triggering events in Part 6.1, where the permittee determines that any revision to control measures is not necessary, the permittee must still document the review and the basis for this determination. Specific information to be included is listed in Part 6.6, Items a-f of the permit. The Department is not requiring permittees to submit this documentation to the Department. Rather, the Department expects permittees to retain this information at the operator physical address specified on the NOI and upon request, to make any such records available to EPA and/or the Department. A summary of this information must also be included in the Summary Report (if requested by the Department) for permittees subject to the Summary Reporting requirement of Part 7.4 of the permit.

7.0 RECORDKEEPING AND REPORTING

This permit requires operators to maintain certain records to help them assess performance of control measures and to document compliance with permit conditions. These requirements are consistent with Department regulations at Regulation 61-9.122.41(j), but have been tailored to more closely reflect requirements of the PGP. Part 7 of this permit describes recordkeeping requirements for all operators and the requirements for certain operators (i.e., those large applicators that are required to submit an NOI). Operators can rely on records and documents developed for other programs, such as requirements under FIFRA, provided all requirements of the permit are satisfied.

The Department recommends that all operators keep records of acres of linear miles treated each calendar year for all applicable use patterns covered under this general permit. This record will help operators estimate when they will exceed the annual treatment area threshold.

The records that must be kept by all operators, specifically the entity who has operational control over the decision to perform pesticide applications, include the following:

- A copy of the permit (an electronic copy is also acceptable);
- Adverse incident reports (See Part 6.4.2);

- Rationale for any determination that reporting of an identified adverse incident is not required consistent with allowances identified in Part 6.4.1;
- A copy of any corrective action documentation (See Part 6.6);
- A copy of any report made under Part 6.5 (Reportable Spills and Leaks); and
- Justification for why Part 4.2 monitoring was not performed, if applicable.

As noted above, operators who are required to submit an NOI must keep additional records. These records are listed below and identified in Section 7.2 of the permit. Section 7.2 of the permit applies to the entity submitting the NOI and to any pesticide applicator hired by such entity to perform activities covered under the permit. Records of equipment maintenance and calibration are to be maintained only by the entity performing the pest management activity on behalf of self or client.

a. A copy of the NOI submitted to the Department and any correspondence exchanged between you and the Department specific to coverage under this permit;
b. The date on which you knew or reasonably should have known that you would exceed an annual treatment area threshold during any calendar year, as identified in Part 1.2.2;
c. Surveillance method(s) used, date(s) of surveillance activities, and findings of surveillance;
d. Target pest(s);
e. Pest density prior to pesticide application;
f. Company name and contact information for pesticide applicator;
g. Pesticide application date(s);
h. Description of treatment area, including location and size (acres or linear feet) of treatment area and identification of any waters, either by name or by location, to which you discharged any pesticide(s);
i. Name of each pesticide product used including the EPA registration number;
j. Quantity of pesticide applied (and specify if quantities are for the pesticide product as packaged or as formulated and applied);
k. Concentration (%) of active ingredient in formulation;
l. For pesticide applications directly to waters, the effective concentration of active ingredient required for control;
m. Any unusual or unexpected effects identified to non-target organisms;
n. Documentation of any equipment calibration (to be kept by pesticide application equipment operator); and
o. A copy of your PDMP, including any modifications made to the PDMP during the term of this permit.

All required records must be prepared as soon as possible but no later than 14 days following completion of the associated activity. Operators must retain copies of these documents for a period of at least 3 years including 3 years from the date their coverage under this permit is terminated. The recordkeeping requirements in Appendix B, Subsection J include a more general statement of the NPDES standard condition for records retention. Note that upon request, you must make available to EPA, the Department, and/or any authorized representative of EPA or the Department, all records kept under this permit and provide copies of such records.

In addition to recordkeeping, the Department is requiring certain operators (i.e., those larger applicators that are also required to submit an NOI) to submit summary reports, if requested by the Department, that contain basic information on their pesticide discharges to surface waters of the State.

The summary report, if requested, must include information for the timeframe specified by the Department in its request.

This information in the summary report, if requested, will be used by the Department to assess permit compliance and to determine whether additional controls on pesticide discharges are necessary to protect water quality. For example, these data could help the Department identify where pesticide discharges are occurring and the types of pesticides discharged.

The summary report is a summary of the pest control activities for each applicable use pattern. The summary report must contain information (included but not limited to the following information) specific to each pest treatment area covered under the permit:

a. Operator's name;
b. Contact person name; title, e-mail address (if any), and phone number;
c. Identification of any waters or other treatment area, including size, either by name or by location, to which you discharged any pesticide(s);
d. Pesticide use pattern(s) (i.e., mosquito and other flying insect pest control, aquatic weed and algae control, aquatic nuisance animal control, forest pest control, intrusive vegetation control, or other similar use pattern (if approved)) and target pest(s);
e. Company name(s) and contact information for pesticide applicator(s), if different from the NOI submitter;
f. Total amount of each pesticide product applied for the reporting year by the EPA registration number(s) and by application method (e.g., aerially by fixed-wing or rotary aircraft, broadcast spray, etc.);
g. Whether this pest control activity was addressed in your PDMP prior to pesticide application;
h. If applicable, reports of any adverse incidents (per 6.4) as a result of these treatment(s); and
i. A description of any corrective action(s), including spill responses, resulting from pesticide application activities and the rationale for such action(s).

8.0 DEPARTMENT CONTACT INFORMATION AND MAILING ADDRESSES

This part of the permit identifies contact information and mailing addresses for any applicable reporting requirements of this permit. Note that depending on the requirement, some reports/notifications are to go to the SCDHEC Regional office while others are to be sent to SCDHEC Central Office location. Generally, Regions are notified for information that may require rapid review and response by the Region to address potential adverse effects or other concerns requiring more immediate attention.

9.0 APPENDICES

A. Definitions and Acronyms

Appendix A of the permit provides permit-specific definitions of statutory, regulatory, and other terms important for understanding this draft permit and its requirements. Any terms that are not listed in this definitions part have the meaning given to the terms by Regulation 61-9.122.2 (the definitions section of the NPDES regulations).

B. Standard Permit Conditions

Regulations require that all NPDES permits contain the standard permit conditions specified in Regulation 61-9.122.41. Appendix B of the permit incorporates those standard conditions with some minor revisions to more clearly address pesticide application operations covered under the PGP. Of note, Subsection A in Appendix B explains the permittee's duty to comply with the conditions of the permit with failure to do so constituting a violation of the federal Clean Water Act and the SC Pollution Control Act.

C. Notice of Intent Requirements

Part 1.2.2 identifies certain operators required to prepare and submit a complete and accurate Notice of Intent (NOI) form to be authorized to discharge under this permit. Operators must submit NOIs in accordance with the deadlines provided in Part 1.2.3 of the permit. The NOI form provides the Department with the information necessary to determine an operator's eligibility to discharge under this permit. The information required by the NOI is outlined in Appendix C of the permit. Operators may submit the signed NOI by one of three ways: electronically as an e-mail

attachment at the e-mail address provided in Part 8.0 of the permit, by facsimile at the number provided in Part 8.0 of the permit, or by regular mail to the address provided in Part 8.1.1 of the permit.

D. Notice of Termination Requirements

Part 1.2.5 of the permit requires certain permittees (i.e., those who have submitted an NOI to be authorized under this permit) to submit a Notice of Termination (NOT) form within 30 days of the occurrence of one of several different triggering events: (1) when a new operator has taken over responsibility for the pest treatment, (2) the operator has ceased aquatic pesticide application covered under the general permit, (3) there is not and no longer will be pesticide discharge, or (4) the operator has obtained coverage under an individual permit or an alternative general permit. Appendix D of the permit contains a copy of the information required to be submitted on the NOT form.

APPENDIX A
PROCEDURES FOR REACHING A FINAL PERMIT DECISION

A. Comment Period (Regulation 61-9.124.10 and 11)

The Department of Health and Environmental Control proposes to issue an NPDES permit to this applicant subject to the effluent limitations and special conditions outlined in this document. These determinations are tentative.

During the public comment period, any interested person may submit written comments on the draft permit to the following address:

SC Dept. of Health and Environmental Control
Water Facilities Permitting Division
Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

For additional information, interested persons may contact Jeff deBessonet at at 803-898-4157.

All written comments received during the public comment period shall be considered in making the final decision and shall be responded to as prescribed below.

Per Regulation 61-9.124.17, the Department is only required to issue a response to comments when a final permit is issued. This response shall:

1. Specify which provisions, if any, of the draft permit have been changed in the final permit decision, and the reasons for the change; and

2. Briefly describe and respond to all significant comments on the draft permit raised during the public comment period, or during any hearing.

The response to comments shall be available to the public.

B. Public Hearings (Regulation 61-9.124.11 and 12)

During the public comment period, any interested person may request a public hearing, if no hearing has already been scheduled. A request for a public hearing shall be in writing and shall state the nature of the issues proposed to be raised in the hearing.

Determinations and Scheduling.

1. Within the thirty (30) day comment period or other applicable comment period provided after posting or publishing of a public notice, an applicant, any affected state or interstate agency, the Regional Administrator or any other interested person or agency may file a petition with the Department for a public hearing on an application for a permit. A petition for a public hearing shall indicate the specific reasons why a hearing is requested, the existing or proposed discharge identified therein and specifically indicate which portions of the application or other permit form or information constitutes necessity for a public hearing. If the Department determines that a petition constitutes significant cause or that there is sufficient public interest in an application for a public hearing, it may direct the scheduling of a hearing thereon.

2. A hearing shall be scheduled not less than four (4) nor more than eight (8) weeks after the Department determines the necessity of the hearing in the geographical location of the applicant or, at the discretion of

the Department, at another appropriate location, and shall be noticed at least thirty (30) days before the hearing. The notice of public hearing shall be transmitted to the applicant and shall be published in at least one (1) newspaper of general circulation in the geographical area of the existing or proposed discharge identified on the permit application and shall be mailed to any person or group upon request thereof. Notice shall be mailed to all persons and governmental agencies which received a copy of the notice or the fact sheet for the permit application.

3. The Department may hold a single public hearing on related groups of permit applications.

4. The Department may also hold a public hearing at its discretion, whenever, for instance, such a hearing might clarify one or more issues involved in the permit decision;

5. Public notice of the hearing shall be given in accordance with Regulation 61-9.124.10.

Any person may submit oral or written statements and data concerning the draft permit. Reasonable limits may be set upon the time allowed for oral statements, and the submission of statements in writing may be required. The public comment period under Regulation 61-9.124.10 shall automatically be extended to the close of any public hearing under this section. The hearing officer may also extend the comment period by so stating at the hearing.

A tape recording or written transcript of the hearing shall be made available to the public.

C. Obligation to raise issues and provide information during the public comment period. (Regulation 61-9.124.13)

All persons, including applicants, who believe any condition of a draft permit is inappropriate or that the Department's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, must raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). No issue shall be raised during an appeal by any party that was not submitted to the administrative record as part of the preparation and comment on a draft permit, unless good cause is shown for the failure to submit it. Any supporting materials which are submitted shall be included in full and may not be incorporated by reference, unless they are already part of the administrative record in the same proceeding, or consist of State or Federal statutes and regulations, Department and EPA documents of general applicability, or other generally available reference materials. Commenters shall make supporting materials not already included in the administrative record available. (A comment period longer than 30 days may be necessary to give commenters a reasonable opportunity to comply with the requirements of this section. Additional time shall be granted under Regulation 61-9.124.10 to the extent that a commenter who requests additional time demonstrates the need for such time).

D. Issuance and Effective Date of the Permit

1. After the close of the public comment period on a draft permit, the Department shall issue a final permit decision. The Department shall notify the applicant and each person who has submitted written comments or requested notice of the final permit decision. This notice shall include reference to the procedures for appealing a decision on a permit. For the purposes of this section, a final permit decision means a final decision to issue, deny, modify, revoke and reissue, or terminate a permit.

2. A final permit decision shall become effective 30 days after the service of notice of the decision unless:

   (a) A later effective date is specified in the decision; or

   (b) No comments requested a change in the draft permit, in which case the permit shall become effective on the effective date shown in the issued permit.

3. Issuance or Denial of Permits. An appeal to a final determination of the Department or to a condition of a permit issued or the denial of a permit pursuant to the State law and Regulation 61-9, shall be in accordance with and subject to 48-1-200 of the SC Code (see E below).

E. Adjudicatory Hearings

1. This issuance of this permit by the S.C. Department of Health and Environmental Control (Department) becomes the final agency decision 15 calendar days after notice of the decision has been mailed or otherwise sent to the applicant, permittee, licensee and affected persons who have requested in writing to be notified, unless a written request for final review accompanied by a filing fee in the amount of $100 is filed with the Department by the applicant, permittee, licensee, or affected person.

2. An applicant, permittee, licensee, or affected person who wishes to appeal this decision must file a timely written request for final review with the Clerk of the Board at the following address or by facsimile at 803-898-3393. A filing fee in the amount of $100 made payable to SC DHEC must also be received by the Clerk within the time allowed for filing a request for final review. However, if a request for final review is filed by facsimile, the filing fee may be mailed to the Clerk of the Board if the envelope is postmarked within the time allowed for filing a request for final review.

   Clerk of the Board
   SC DHEC
   2600 Bull Street
   Columbia, SC 29201

3. In order to be timely, a request for final review must be received by the Clerk of the Board within 15 calendar days after notice of the decision has been mailed or otherwise sent to persons entitled to receive notice. If the 15th day occurs on a weekend or State holiday, the request is due to be received by the Clerk of the Board on the next working day. The request for final review must be received by the Clerk of the Board by 5:00 p.m. on the date it is due. A request for final review will be returned to the requestor if the filing fee is not received on time as described above.

4. The request for final review should include the following:
   a. The grounds on which the Department's decision is challenged and the specific changes sought in the decision;
   b. A statement of any significant issues or factors the Board should consider in deciding whether to conduct a final review conference; and
   c. A copy of the Department's decision for which review is requested.

5. If a timely request for final review is filed with the Clerk of the Board, the Clerk will provide additional information regarding procedures. If the Board declines in writing to schedule a final review conference, the Department's decision becomes the final agency decision and an applicant, permittee, licensee, or affected person may request a contested case hearing before the Administrative Law Court within 30 calendar days after notice is mailed that the Board declined to hold a final review conference.